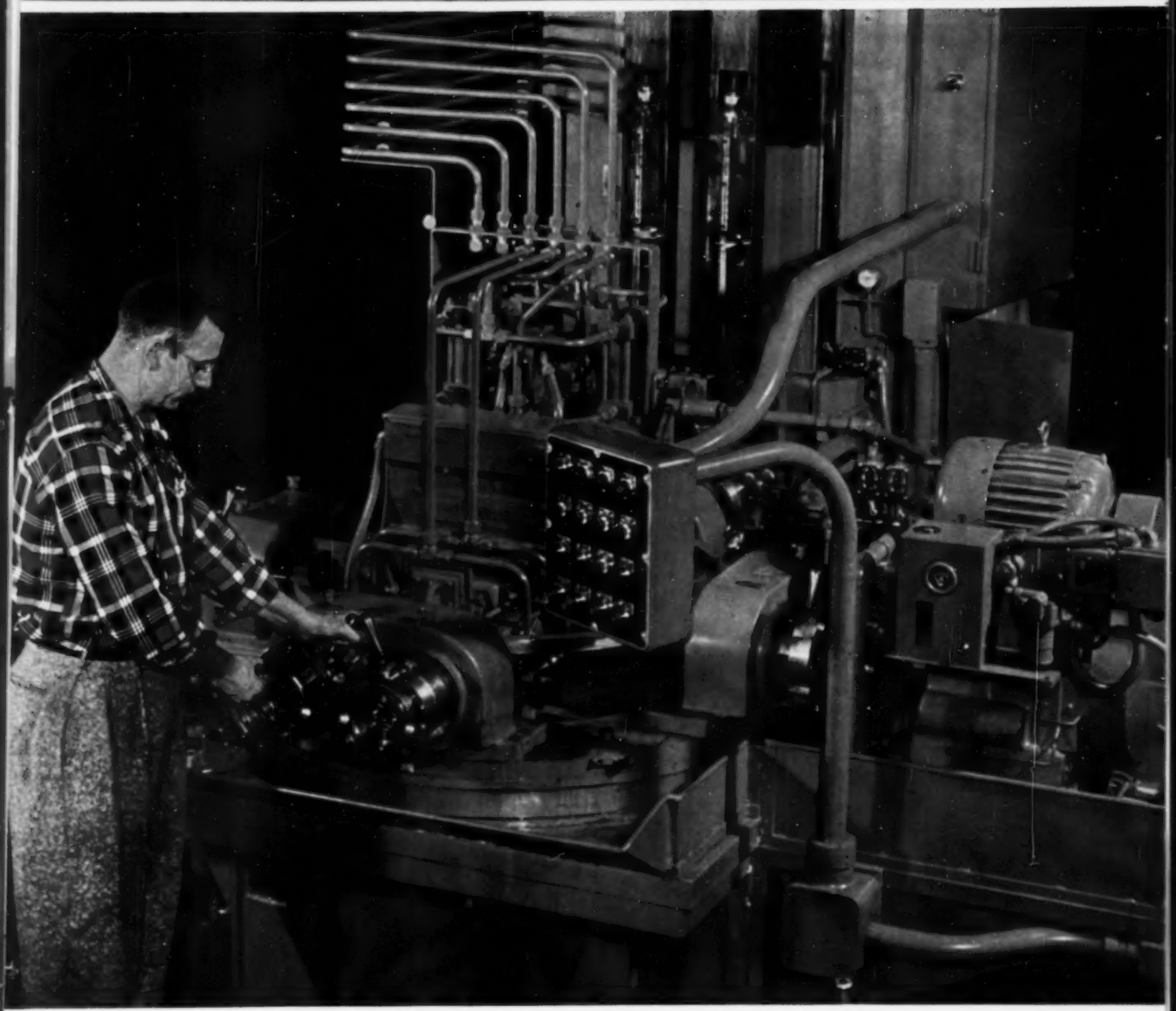
American Machinist

JUNE 16, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Sub-zero Quench

page 106



Broach and mill in one machine saves 70% of cutting time—see page 100

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it's mainly a matter of TIMING!

But WHEN to replace a machine depends on more than its age

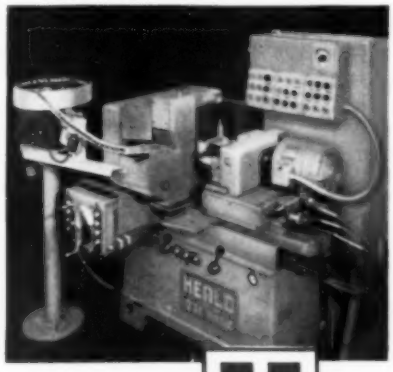
YEARS ALONE don't tell you when a machine has reached retirement age. In fact the age of a machine may be a relatively minor factor in computing the time at which it should be replaced. Some old machines may still have many years of economically productive life. While more recent ones, of a different type, may have already outlived their profitability in your plant.

It depends on many variable factors—including the comparative efficiency of the proposed new machine, and any design improvements which will become available in the foreseeable future. But whatever the replacement conditions proper timing can mean the difference between *profit* and *loss*. Too early is just as bad as too late. But there is *one* mathematically predictable time when replacement will cost you the least amount of money. This replacement minimum can't be determined by guesswork, intuition, or rule-of-thumb. It requires precise methods of replacement analysis, based on proved economic principles.

Our sales engineers are well experienced in making such obsolescence studies. And they will be glad to do the same for you. Similar studies by Heald engineers have pointed the way to many important *savings*.

For Example: A manufacturer of automotive parts was using two ten-year-old Heald Model 81 Centerless Internals for grinding a blind hole in steel bushings. A cost analysis showed that two new Heald Model 180 Centerless Internals, like that shown at the right, could do the *same job* at a saving of more than 66% in total operating cost. The replacement of the two old machines with two new ones resulted in the production and cost savings shown below.

	2 Old Machines	2 New Machines
Parts per hour	276	426
Parts per year (Req'd. Prod.)	552,000	552,000
Direct Labor, per year	$ 7,252	$ 3,746
Scrap Losses, per year	$ 4,182	$ 705
Annual Maintenance	$ 2,752	$ 250
Annual Operating Cost	$14,186	$ 4,701
Annual Saving for New Machines		**$9,485**



YOU pay for obsolescence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

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American Machinist
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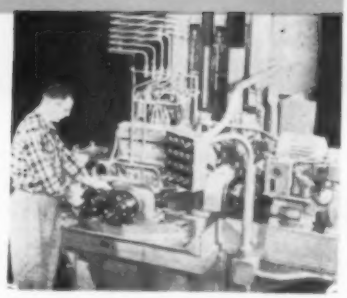
American Machinist chips



Kudos Again . . . Early this month, *American Machinist* received two Awards of Merit in the 20th Annual Editorial Competition conducted by *Industrial Marketing*. One of these was for the series of eyewitness reports on metalworking in the Soviet Union that we published early last year. The other was for the Special Report on numerical control by Associate Editor William M Stocker, Jr. To Norman Stubbs and Peter Trippe who spent many weeks in Russia gathering data, to News Editor Robert Sheets who edited the series, and to Bill Stocker, go our thanks for the work that brought these awards. We add them with pleasure to the five Neal Awards received by our staffers last month. Patting yourself on the back is always hazardous—it strains the arm and blisters the back—so we'll turn at once to what we are doing *now*:

Tolerances . . . The 15-part series of Reference Book Sheets on Tolerances and Limits that we published last year was devoured by readers—we had to reprint the series to meet the demand. Walter Harrington at Avco's Research and Advanced Development Division was one of the avid readers. Starting from this series and drawing on other source material, Mr Harrington developed a series of lectures to explain both geometric and true-position tolerances. This series of lectures has been highly successful, both at Avco and at other places. Now, we take his lectures in turn and convert them into a series of Reference Book Sheets that put a complex subject into simple terms. You'll find the series starts on page 115.

Ideas Galore . . . Articles in this issue are packed with ideas, deal with a wide variety of subjects: Two ways to precision machine honeycomb are described by William Koehler of Aeronca (page 97) and a brazing method to assemble paper-thin stainless at Stewart-Warner is on page 105. Three cost-cutting ideas in press stock, wire welding, and plastic molding start on page 102. You'll find a new fixture and a two-headed welder triple the welding speed (page 108) and a simple method of handling sub-zero quenching developed at Douglas (page 106).

Coming . . . *AM* for June 30 will feature a Special Report on adhesive bonding. The series of case studies on automation devices that began in our Tool Show Issue will continue as will the Harrington series on tolerances. You'll find another unique replacement program, a study of how Alco interchanges pre-tooled machines, and all the regular departments.

Cover . . .

Milling and broaching are combined in a single machine built for Eaton by American Broach. Details of the operation are on page 100.

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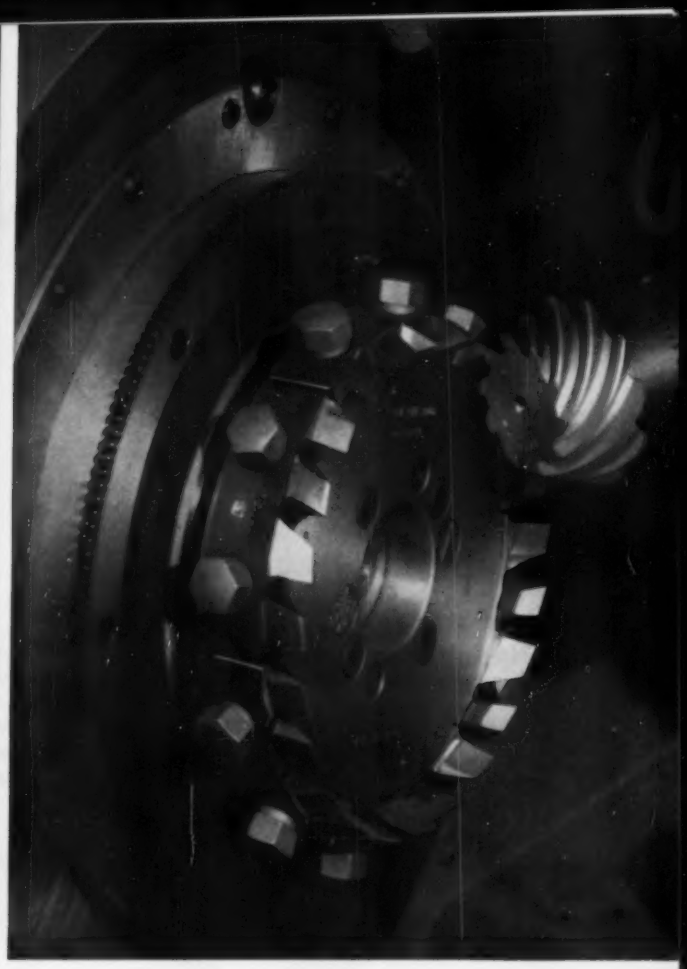
SPIRAL BEVEL GEAR



HYPOID PINION

How to produce both with just *one* cutter, *one* machine

These two parts alone show why the Unitool* Method is ideal for economical job shop operation, for trying new ratios, and for producing prototypes.

You need only one machine—either the No. 116 Hypoid Generator or the smaller No. 106—and one cutter to produce both parts.

You complete both parts from the solid before removing them from the machine.

Add just five more cutters and you are equipped to produce spiral bevel and Zerol® bevel pairs of any ratio, and hypoid pairs of 3:1 ratio and higher. You can cut any of these gears up to 18″ pitch diameter.

*Trademark

No special training needed The operator uses direct common sense methods to set for the correct tooth thickness and position of contact. No lengthy, expensive training is necessary.

Fast change-overs You can switch to different sizes or types of gears in minutes. A calculated set-over is all it takes to get the right gear size. No other measurements are necessary.

Bulletins—Write for bulletins on the Unitool Method and the two generators which outline all the advantages of the method and explain its operation in detail.

With the Unitool Method you use just one cutter to produce the three types of gear pairs shown here. Such versatility cuts costs sharply on small-lot production.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

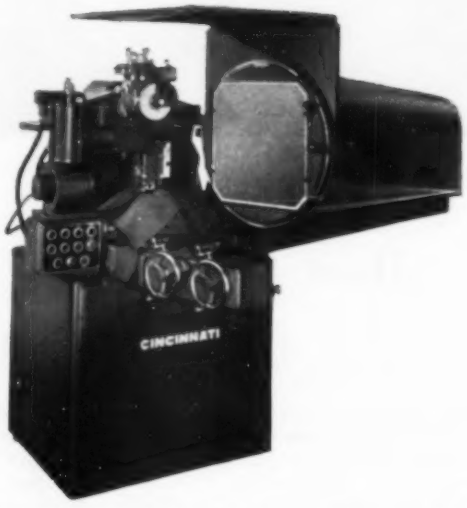
1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

For Top

. . .

No. 1—A companion machine for the No. 2, and for shops using only small- to medium-sized cutters, the No. 1 will be your first choice. Timesaving features include anti-friction table slide; eccentric wheelhead swivel mounting; reversible motor built into wheelhead; three-way controls. Capacity: 8" swing over table, 15" between centers. Catalog No. M-1852-2.

CINCINNATI



PROJECTO-FORM—For grinding small, accurate profile shapes on flat form cutters, lamination die parts and similar components. This machine combines grinding with an optical comparator unit. Work profile is enlarged 20 X on ground glass viewing screen directly in front of operator. Master drawings made on Layout Scribing Machine. Catalog No. M-1612-5.

CONTOUR—This machine offers a big saving for shops having a volume of form milling operations. It grinds form milling cutters on the periphery of the teeth to a definite cutting clearance chosen for the work material. Contour ground cutters produce a greatly superior finish at a higher feed rate. Catalog No. M-1918-1.

CINCINNATI®

MILLING MACHINES • BROACHING MACHINES • CUTTER
METAL FORMING MACHINES • HARDENING MACHINES •

Metal Cutting Efficiency

Cincinnati gives you a choice of 5 Cutter and Tool Grinders

No. 2—For grinding the majority of cutters used in metalworking shops of all sizes . . . milling cutters, reamers, hobs, taps, planer tools. Host of attachments available, including Radius Grinding; Face Mill; Indexing for Workhead; Dust Exhaust; Spring Chucks and Collets. Capacity: 10" swing over table, 27" between centers. Catalog No. M-2004.

Whatever is good for the cutting edge of your expendable tools is good for production. And CINCINNATI® Cutter and Tool Grinders are certainly good for the cutting edges of all types of milling and die sinking cutters, reamers, hobs, taps and others. There are five machines in the Cincinnati group. They constitute an exceptionally strong secondary line of production equipment for machine tools of all types. Sweet's Machine Tool File contains brief specs, and complete data may be obtained by writing for catalogs.

MONOSET—For sharpening, repairing and making small cutters including countersinks, those required for die sinking, and other unusual shapes. Because of the universal construction, most jobs can be completed in one chucking. Built-in spiral lead mechanism generates infinitely variable helices, right- or left-hand, $1\frac{13}{16}$" min. lead. Catalog No. M-1591-4.

AND TOOL GRINDERS • SPECIAL MACHINE TOOLS
CUTTING FLUIDS • GRINDING WHEELS

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

HEAVY DUTY GEARS

FELLOWS
36-TYPE
GEAR SHAPER
Internal and external spurs, helicals and herringbones up to 36" P.D., 6" face width.

FELLOWS 120"
GEAR SHAPER
Internal and external spurs and helicals up to 120" P.D., 8" face width.

THE PRECISION LINE

"BIG" FOR THE ONES"

Are Cut on Fellows Gear Shapers

Year after year, larger and more productive road building equipment puts increasingly severe demands on manufacturers for tough, smooth-running gears. To meet these demands, many of America's most important equipment makers use Fellows Gear Shapers for economical, accurate, high-speed production.

Here are actual examples of Fellows efficiency in the plants of road building equipment makers:

Material: cast steel, 290-330 Brinell
Gear: 138-tooth, 5" face width, 1.783 C.P.
Total depth of cut: 1.180"
Cutting time (four cuts): approx. 1181 minutes
Machine: Fellows 120" Gear Shaper

Material: 4620 SAE Steel
Gear: 76-tooth, 4" face width, 3 D.P.
Total depth of cut: 0.740"
Cutting time (two cuts): 258 minutes
Machine: Fellows 36-Type Gear Shaper

For gear production capacity from 1/16" to 120" P.D., look to the complete Precision Line of Fellows equipment. For full information about gear shapers, shavers, grinding machines, inspection instruments or cutting tools to solve your gear production problems, just write or phone your nearest Fellows office.

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Branch Offices: 1048 North Woodward Ave., Royal Oak, Michigan
150 West Pleasant Ave., Maywood, New Jersey
5835 West North Ave., Chicago 39, Illinois
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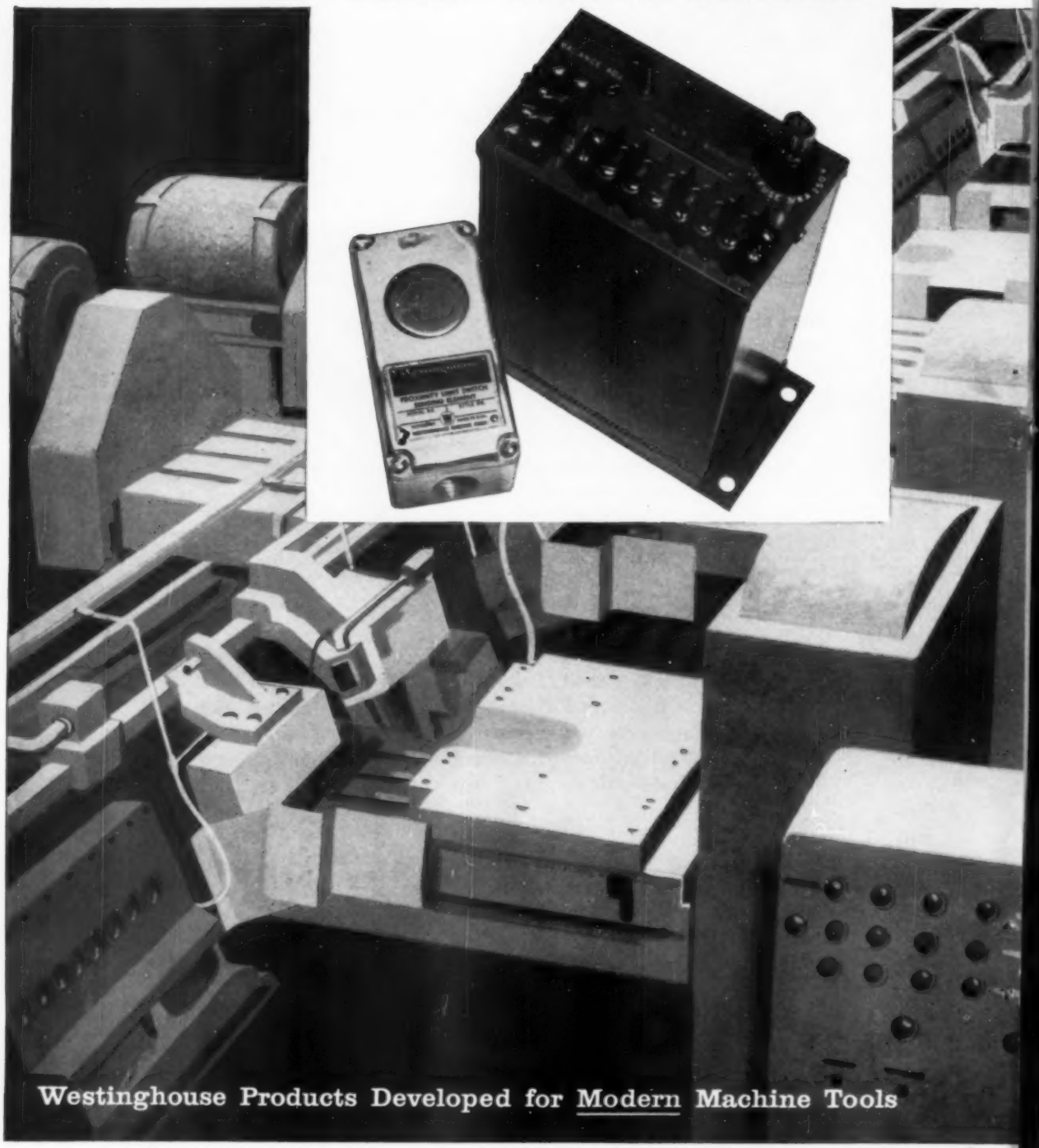
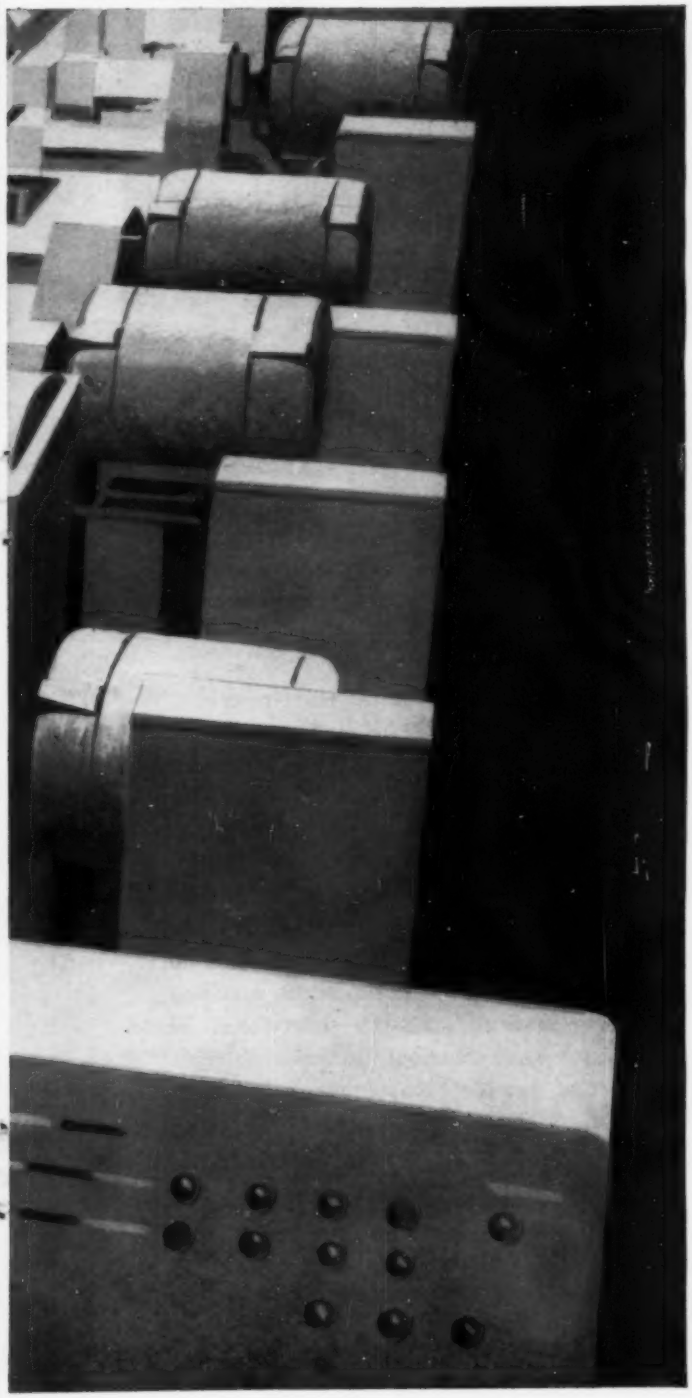
Fellows *Gear Production Equipment*

NEW PROXIMITY LIMIT OUTLIVE THE MACHINE IT



Westinghouse Products Developed for Modern Machine Tools

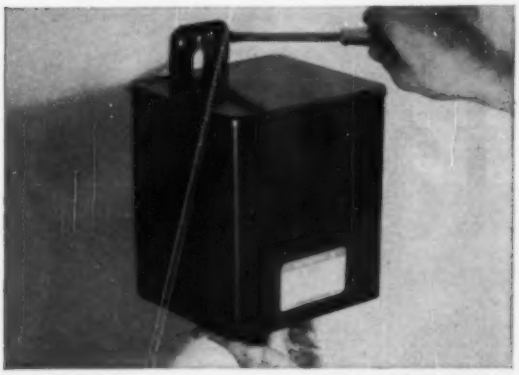
SWITCH WILL CONTROLS



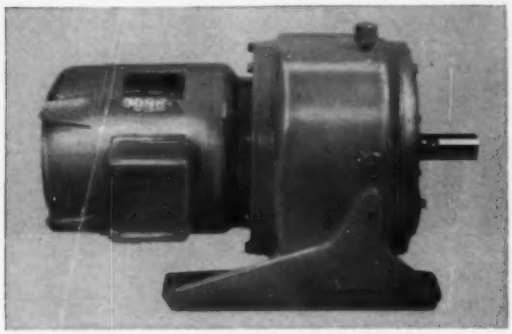
With the elimination of conventional mechanical parts, the new Westinghouse Proximity Limit Switch is the final link in a truly reliable control system. Developed and designed through practical research in Westinghouse engineering facilities, this new product is suitable for a wide range of application in the machine tool industry.

Westinghouse products like this are the sign of a modern machine tool, designed to give the most production at the lowest possible cost. An electrical system, designed and supplied by Westinghouse industry-experienced engineers, is sure to give the best in long-term economical service.

For complete information about Proximity Limit Switches and the other Westinghouse components for modern machine tool systems, ask your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-06110-R



Westinghouse EP Machine Tool Transformers cut space requirements up to 50%, can be mounted in any position. Accelerated life tests indicate new design doubles normal machine tool transformer life.



New Moduline Gear Units use 15 basic subassemblies to standardize over 20,000 gearing configurations. One wrench modifies any unit. Gears meet AGMA "master-gear" standards for quiet, maintenance-free operation.

YOU CAN BE SURE...IF IT'S

Westinghouse

coarse threads tapped at lower cost

A LANDIS ALT Collapsible

Tap produces coarse pitch threads in less than a minute in one pass at the Holys Mfg. Co., 1545 S. Circle Ave., Forest Park, Ill. The workpiece is a component part for an explosion-proof rotating bronze coupling produced by Brad Harrison Co., Manufacturer Electrical Connectors, Hillside, Illinois.

JOB SPECIFICATIONS

Material: SAE 63 naval bronze casting

Thread Specifications:

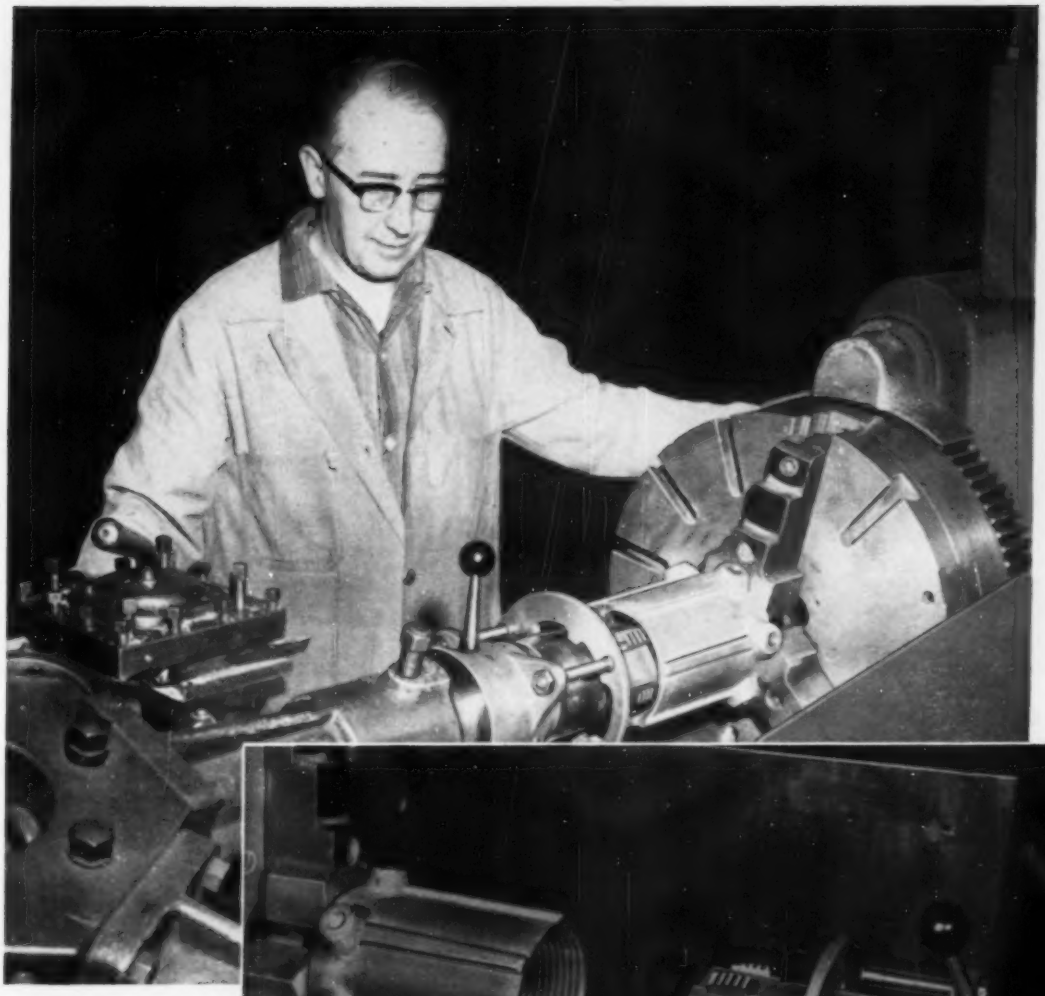
Diameter	4.640"
Length	4¼"
Type	4 pitch modified square

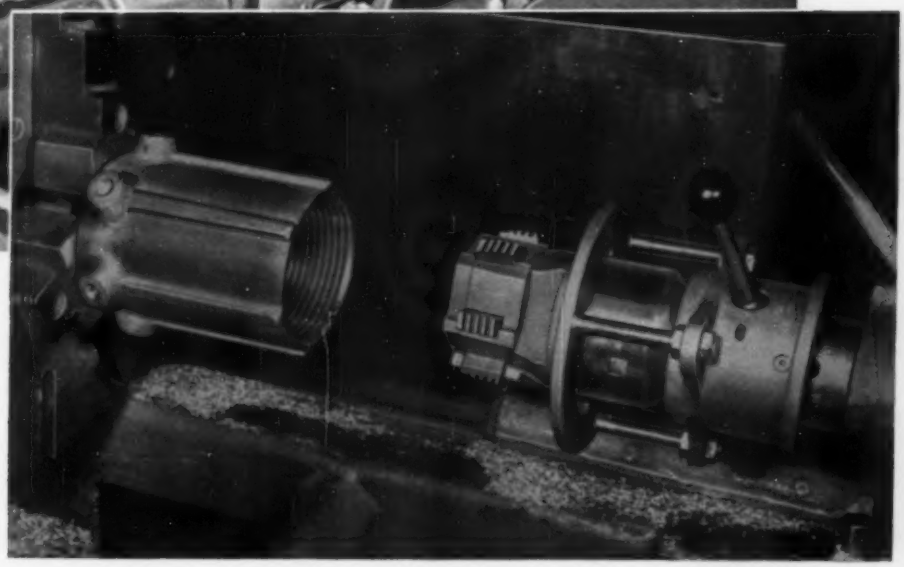
Equipment: LANDIS 5ALT Tap with a 4-½" tap head on a No. 5 Gisholt turret lathe

This installation is an example of the "money-saving" potential of LANDIS Taps. Their ability to tap large diameter coarse pitch brass or steel threads requiring heavy metal removal in one pass reduces threading time. "Built to take it" construction assures years of productive service and allows the initial investment to be spread over a long period. Detachable tap heads give wide range coverage, keeping tool investment to a minimum (the 5ALT Tap illustrated covers a range of 1⅝" to 6⅝" with 9 tap heads). Futhermore, LANDIS Precision Tap Chasers produce a maximum number of pieces between grinds with less down time for chaser resharpening. These features all contribute to reducing the actual "per piece" tapping cost.

For more complete information on other design features and the various sizes of ALT Taps for threading all diameters from 1¼" to 13¼", see your nearest LANDIS Agent or write for Bulletin G-94.

523C





Threading Machines

Die Heads—
Rotary & Stationary

Taps—Collapsible
& Solid Adjustable

Centerless Thread
Grinding Machines

Thread Rolling Tools

Thread Rolling Machines

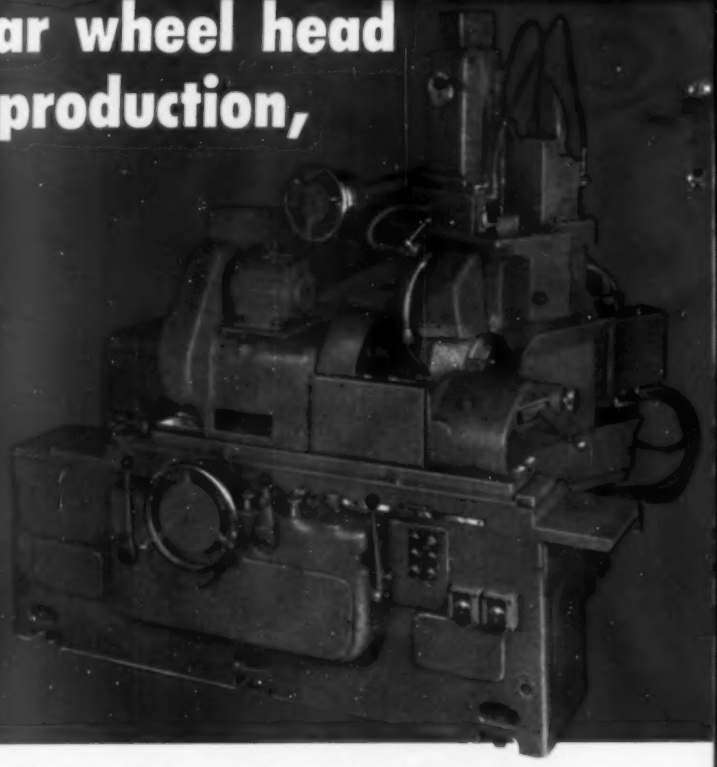
LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

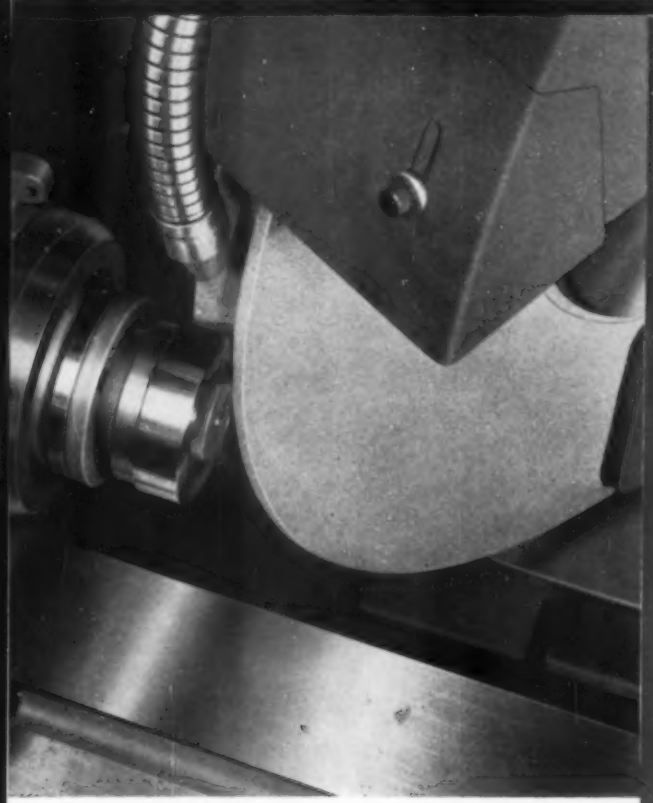
How Landis angular wheel head grinders increase production, lower costs

Landis 30° angular wheel head plain grinders can combine face, multiple diameter and profile grinding into one operation. This replaces single operations, improves quality, lowers setup time and handling time.



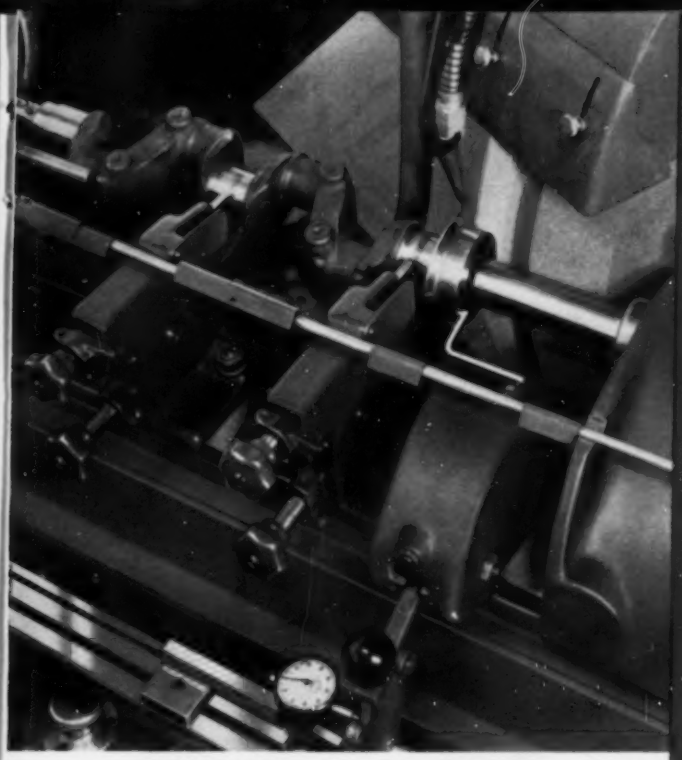
LANDIS
precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

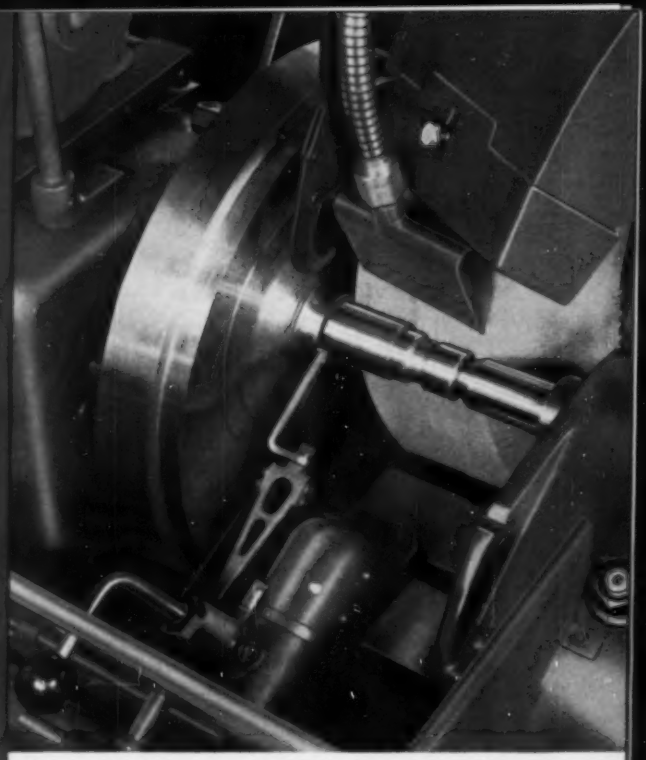


Two grinding operations. Infeed grinding diameter and end of transmission part at same time. Production: 125 per hour.

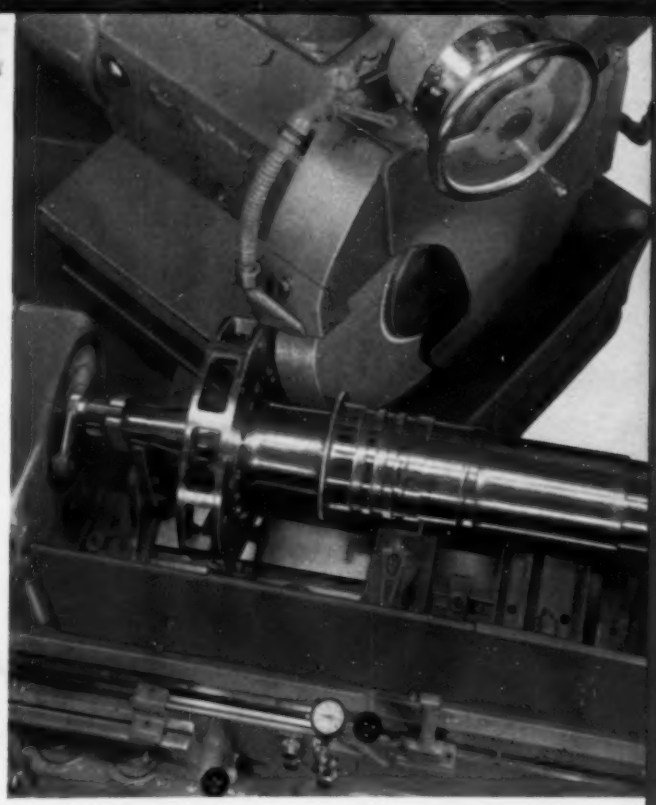
Combining operations. Infeed grinding narrow diameter and flange face of differential shaft in one operation. Production: 65 per hour.



Grinding two diameters and face angle. All 3 ground at one time on light crankshaft.



Five grinding operations. 3 diameters, a face and radius ground in one infeed operation.



Grinding face and radius. A large face and a blending radius on turbine shaft ground in one of a series of infeed operations.

Six grinding operations. 3 different diameters and 3 radii ground in one infeed operation of automotive part at high production.

GIDDINGS & LEWIS

(MODEL 300-T)

precision horizontal boring, drilling and milling machine

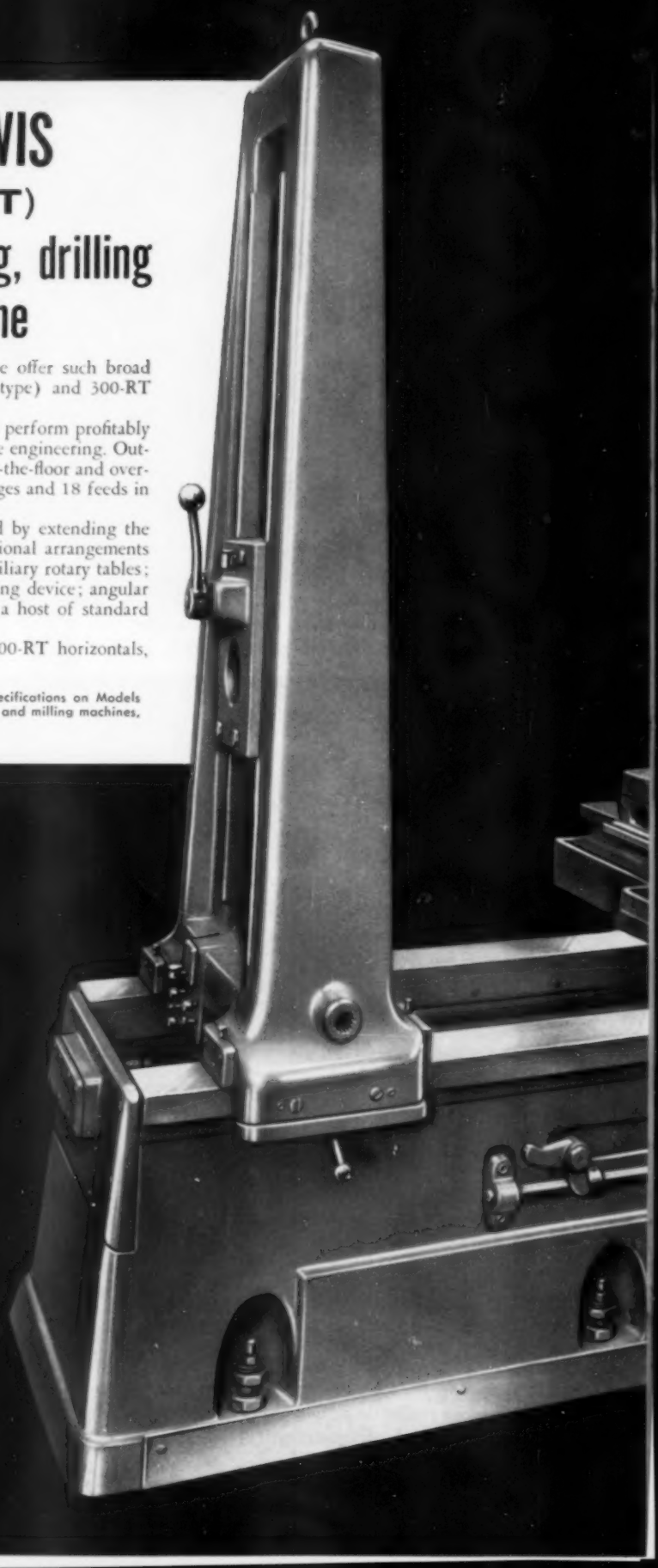
No other horizontal bars of comparable size and type offer such broad machining possibilities as G&L Models 300-T (table-type) and 300-RT (revolving table-type) with 3" diameter spindle.

These versatile boring, drilling and milling machines perform profitably without loss of down time because of G&L's progressive engineering. Outstanding design features include rigid saddle support, in-the-floor and over-the-floor auxiliary runways, 45 optional speeds in 5 ranges and 18 feeds in any range — augmented by a total of 23 milling feeds.

Profitable production capacities are further increased by extending the machine's normal working range with a variety of optional arrangements and attachments: quick change spindle (optional); auxiliary rotary tables; automatic electric positioning device; improved measuring device; angular milling attachments; continuous feed facing head and a host of standard Davis boring bars and cutters.

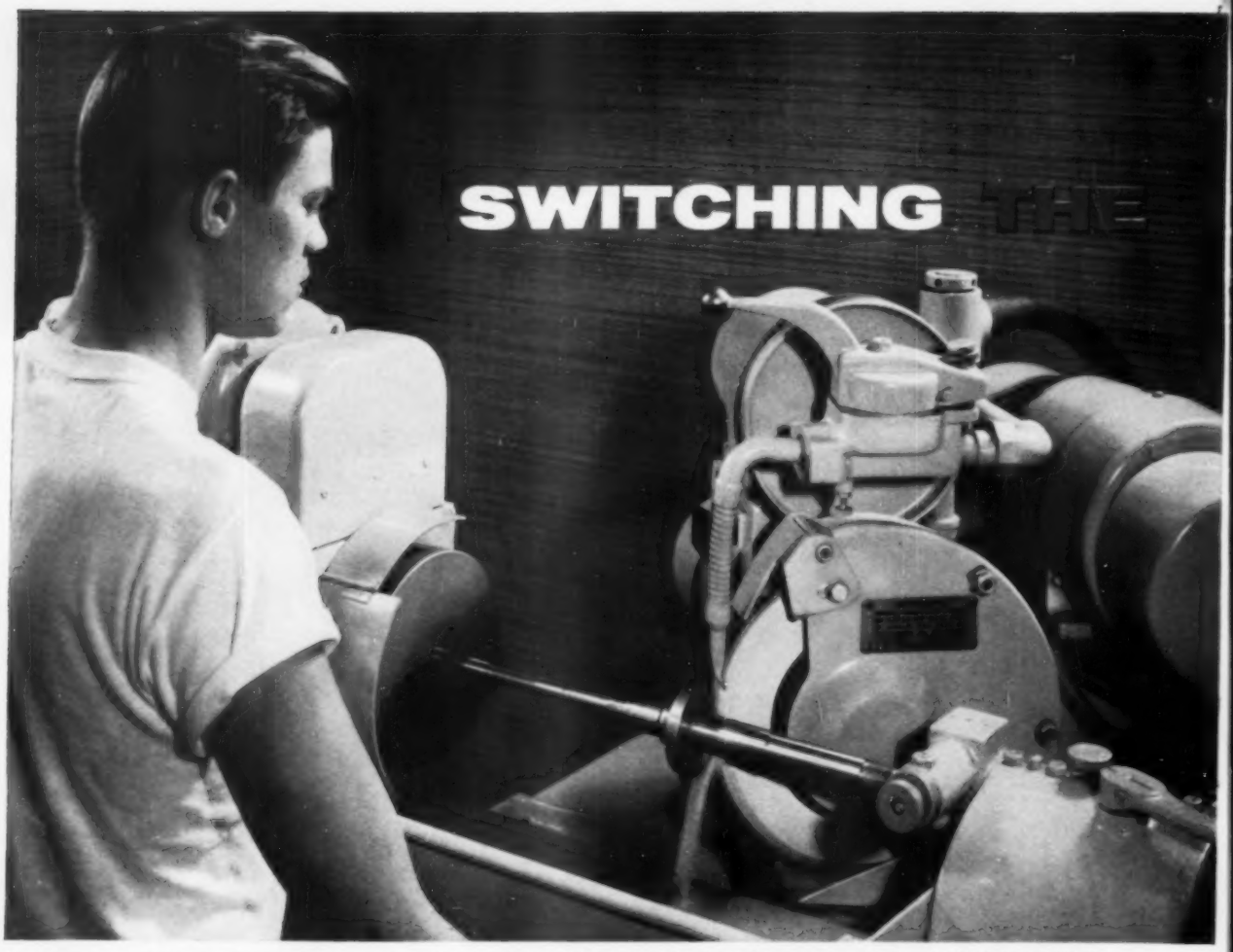
For more information on the Models 300-T and 300-RT horizontals, see your nearest G&L representative or write direct.

LITERATURE AVAILABLE: For complete specifications on Models 300-T and 300-RT horizontal boring, drilling and milling machines, write for Bulletin No. 300-T.



G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-73

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.



Right-hand face of a shoulder is ground to a superior finish by switching the grinding wheel and drive. CINCINNATI FILMATIC 10" Universal Grinder.

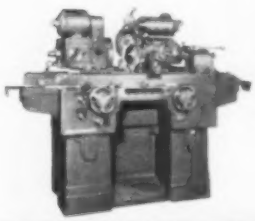
10"—CINCINNATI FILMATIC Universal Grinding Machines—12", 14", 18"

nominal swing over table	10"
length between centers	24"
grinding wheel	12" x 1" x 5" hole
motor drives — grinding wheel	2 hp
internal head	1 hp

Ask for catalog No. G-577-6

nominal swing over table	12"	14"	18"
three lengths between centers	36", 48", 72"		
two grinding wheels supplied	14" x 1½" x 5" hole 14" x 1" x 5" hole		
motor drives — grinding wheel	3 hp	5 hp	5 hp
internal head	1 hp	2 hp	2 hp

Ask for catalog No. G-663-2



FILMATIC grinding wheel spindle bearings and many additional features and advantages are incorporated in all Universal Grinding Machines built by Cincinnati, briefly spec'd in the above tables. Ask for the literature mentioned, or look in Sweet's Machine Tool File for condensed information.

FILMATIC

CINCINNATI®

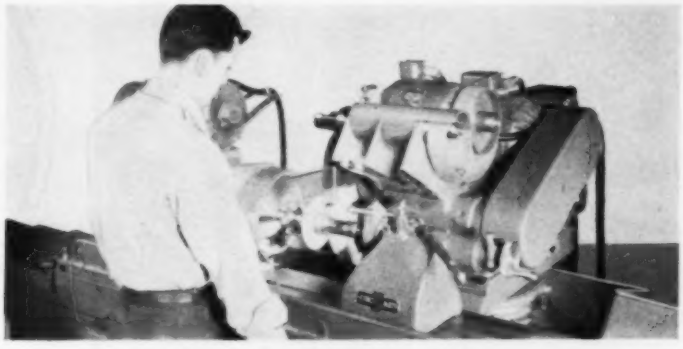
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING
ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

WHEEL MOUNT AND DRIVE

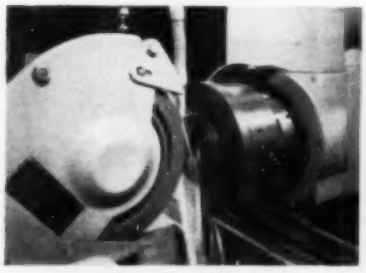
...produces the highest quality finish on right-hand shoulders. It is one of dozens of conventional and unusual precision grinding operations performed at the lowest cost on Cincinnati Filmatic Universal Grinders

CINCINNATI

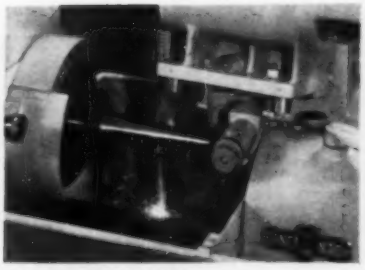
Internal grinding—12" Machine



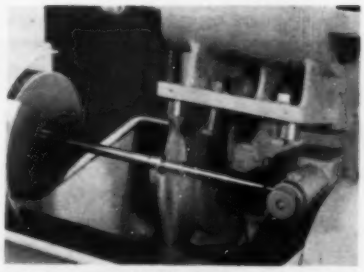
Infeed grinding—14" Machine



Rotary surface grinding—
10" Machine



Traverse grinding—
steep angle taper—10" Machine



Traverse grinding—
long, slender part—10" Machine

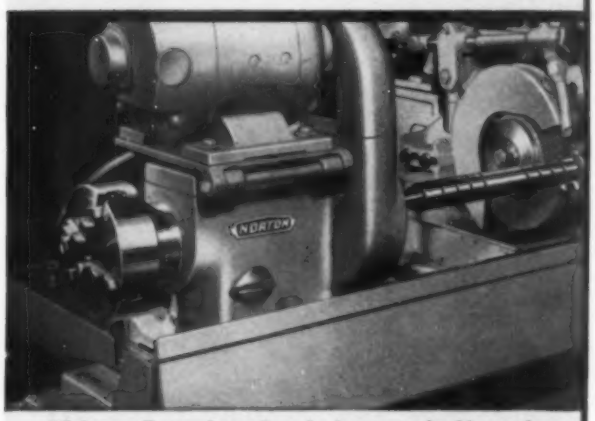
Note: Magnetic chuck for rotary surface grinding and double extension shaft motor for switching the grinding wheel and drive are extra cost items.

MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

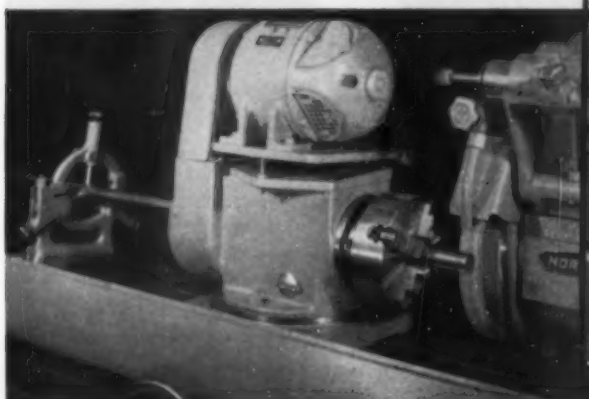
Norton builds extra versatility into universal grinders...

JOB-SPEEDING FEATURES

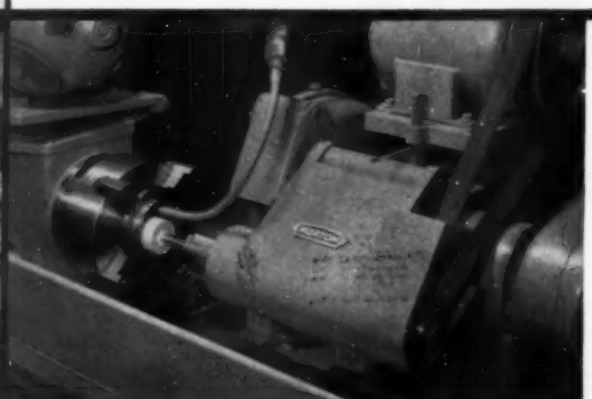


Minimum effort to change from dead center to chucking work. Chuck may remain mounted at back end of headstock while dead-center grinding.

to put extra dollars in your pocket

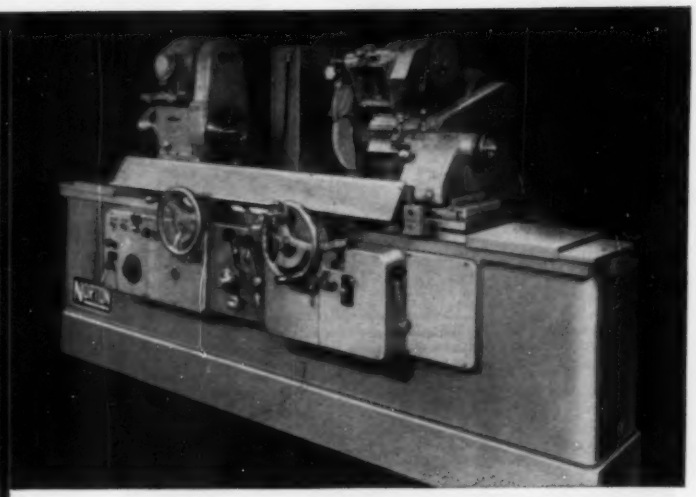


Hollow headstock spindle gives you additional capacity for grinding long bars by passing them clear through and supporting them in grinding position.



Hinged-bracket type internal grinding spindle swings up and out of the way when not in use. This means quicker setups for your I.D. or O.D. grinding.

Norton 10″ universal grinder. Made with 20″ or 24″ nominal lengths between centers. Catalog 170.



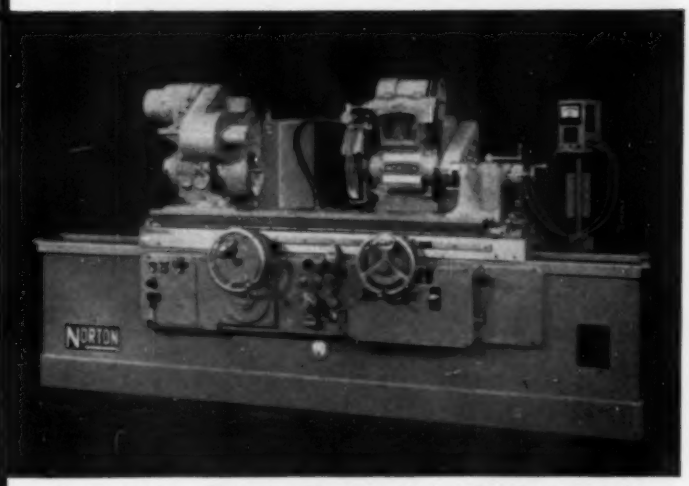
Norton 12″ Type U-4 universal grinder. Made with 36″ or 48″ nominal lengths between centers. Catalog 231.

Many a user rates his Norton universal grinder as a practically "complete grinding department." Why? Because Norton builds extra versatility into its universals for faster external, internal, face, taper and angular wheelside grinding, including many special jobs. Also they're built with many famous job-speeding, cost-cutting features: For example:

Extremely rapid chucking . . . quick change-over to live or dead spindle operation . . . easy work speed changes . . . independent wheel settings that do difficult jobs fast . . . extra capacities on wheel head and headstock . . . precise swivel table alignment with the SWIVALIGN *Dual Electric Indicator, an optional extra.*

Made In The Size You Need

Norton universal grinders are made in 10″, 12″, 14″ and 18″ swing capacities. That means you can get exactly the size to bring you many time-and-money-saving "Touch of Gold" advantages. For complete facts on these high-efficiency machines see your Norton representative or write us direct. And remember: Only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.



Norton 14″ Type U-4 universal grinder. Made with 36″, 48″ or 72″ nominal lengths between centers and also in 18″ swing capacity. SWIVALIGN* Dual Electric Indicator, at right of picture, measures swivel table adjustments and is optional on all Norton universal grinders. Catalog 819.

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-oat Tapes

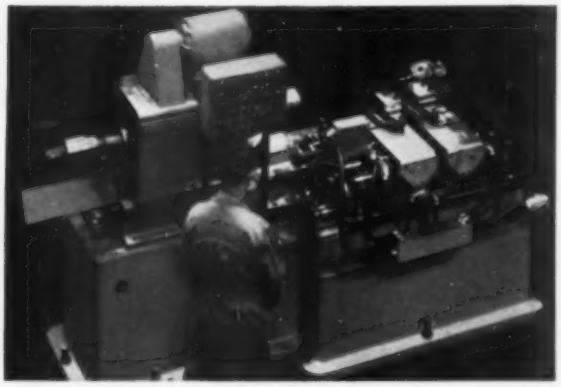
District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

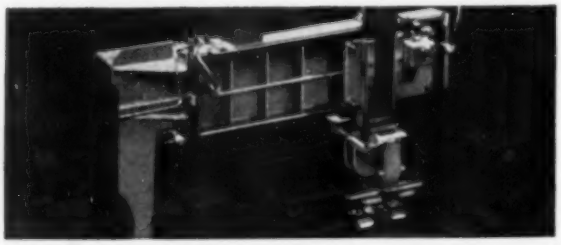
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Profitable High Production Machining Methods

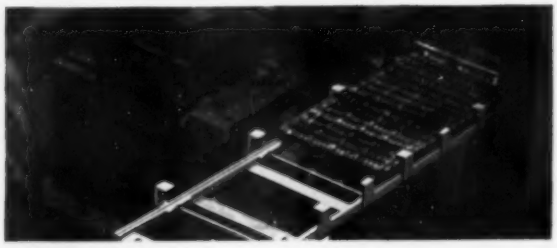
...from standard machine elements and Sundstrand "Engineered Production"

● Basic machine unit in this Sundstrand transfer line is the production proved automatic lathe, specially tooled to provide maximum machining efficiency. Support of the workpiece close to the cut, plus the inherent rigidity of the Sundstrand design, combine to eliminate chatter and improve tool life.

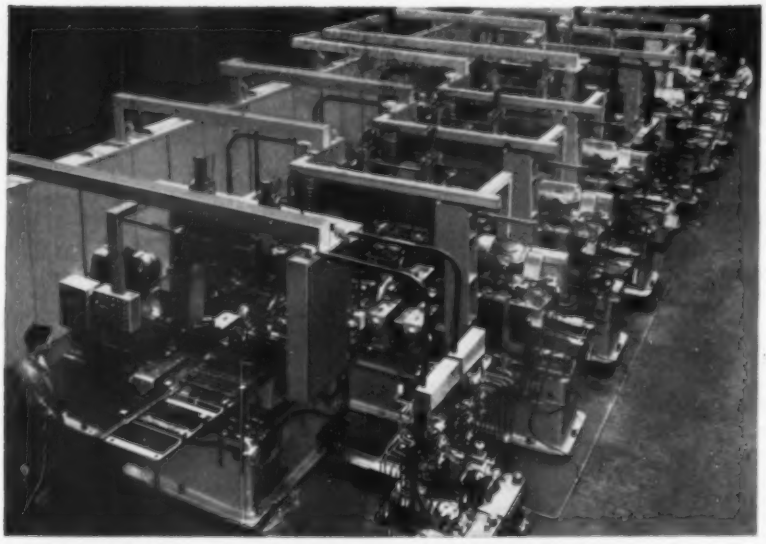




● Third—thru type conveyor is provided for moving parts from one station to the next. Conveyor can be inclined for gravity movement or use positive feed.



● Next, is added the handling system (above right) that lifts work from conveyor automatically and positions it precisely between driving chuck and live center.



THE RESULT is this eight station transfer line using carbides for roughing at stations 1-4 and cemented oxide tools at stations 5-8 for finish turning. Production is over 200 camshafts per hour at 80% efficiency.

That's how Sundstrand "Engineered Production" plus unit construction combine to give you the best buy in high production machine tools. Because the basic elements are "production proved" you're sure performance will meet or exceed specifications.

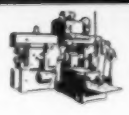
For more examples of Sundstrand cost-cutting transfer lines, write today for your copy of Bulletin 192.

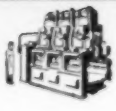
SUNDSTRAND MACHINE TOOL CO.

2533 ELEVENTH ST., ROCKFORD, ILLINOIS

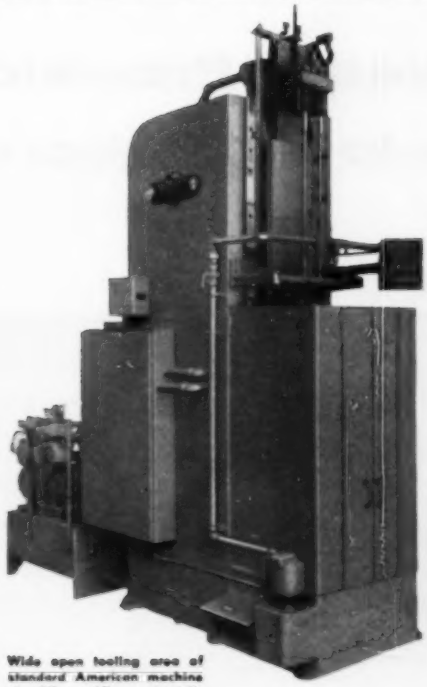
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS | TRIPLEX RIGIDMILS | SPECIAL MACHINES

SUNDSTRAND "Engineered Production" Service"

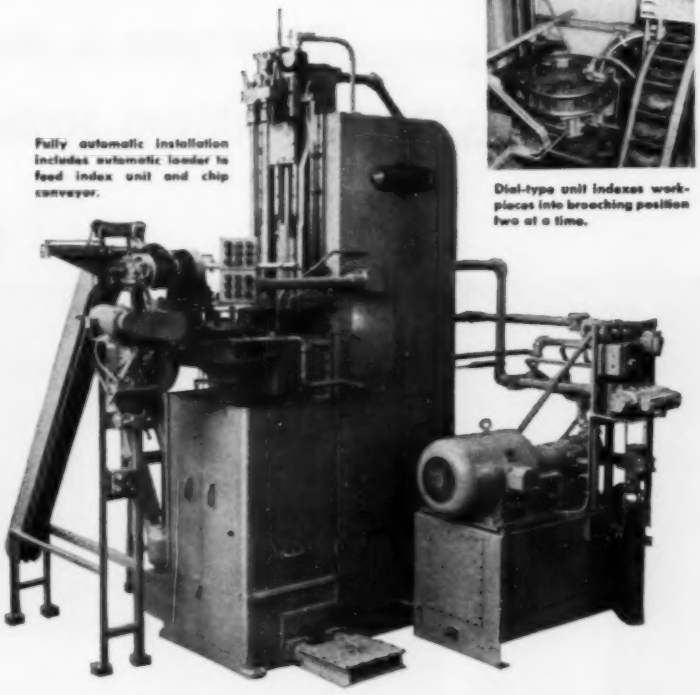




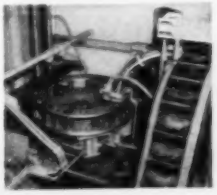
American's Design Features Provide the Basis for Fully Automatic Broaching



Wide open tooling area of standard American machine simplifies adding automatic broaching.



Fully automatic installation includes automatic loader to feed index unit and chip conveyor.



Dial-type unit indexes workpieces into broaching position two at a time.

There's nothing special about the machine at upper right except its ability to turn out a high volume of quality parts. Like the machine at the upper left, it's a standard 25-ton, 54-inch stroke American pull-down machine and was actually used with manual loading in pilot run production before the automation features were added.

Two transmission brake sleeves are broached at a time in a 24-second, fully automatic cycle to produce 300 pieces per hour. All components are electrically interlocked for maximum safety. American machines are designed with a wide open tooling area to permit efficient utilization of fixturing for either semi-automatic or fully automatic broaching. Both the hydraulic package unit consisting of tank, pump, etc., that operates the automatic fixtures, and the separate hydraulic unit required by the machine itself can be floor-mounted where machine is pit installed.

Behind every such successful installation are these three features that are an essential part of American "Engineered Production": (1) proper broach tool design; (2) selection of the best machine for the job; and (3) efficient fixturing. Because American provides these all-important ingredients with no division of responsibility, you are sure to get a highly efficient installation without placing an added burden on your engineering and manufacturing staffs. You get this manufacturing engineering experience and skill at no extra cost. It's just another reason why American gives you the best buy in broaching no matter how simple or complex your installation.

Write today for your copy of Bulletin A-127 describing American pull-down broaching machines.

American BROACH & MACHINE DIVISION

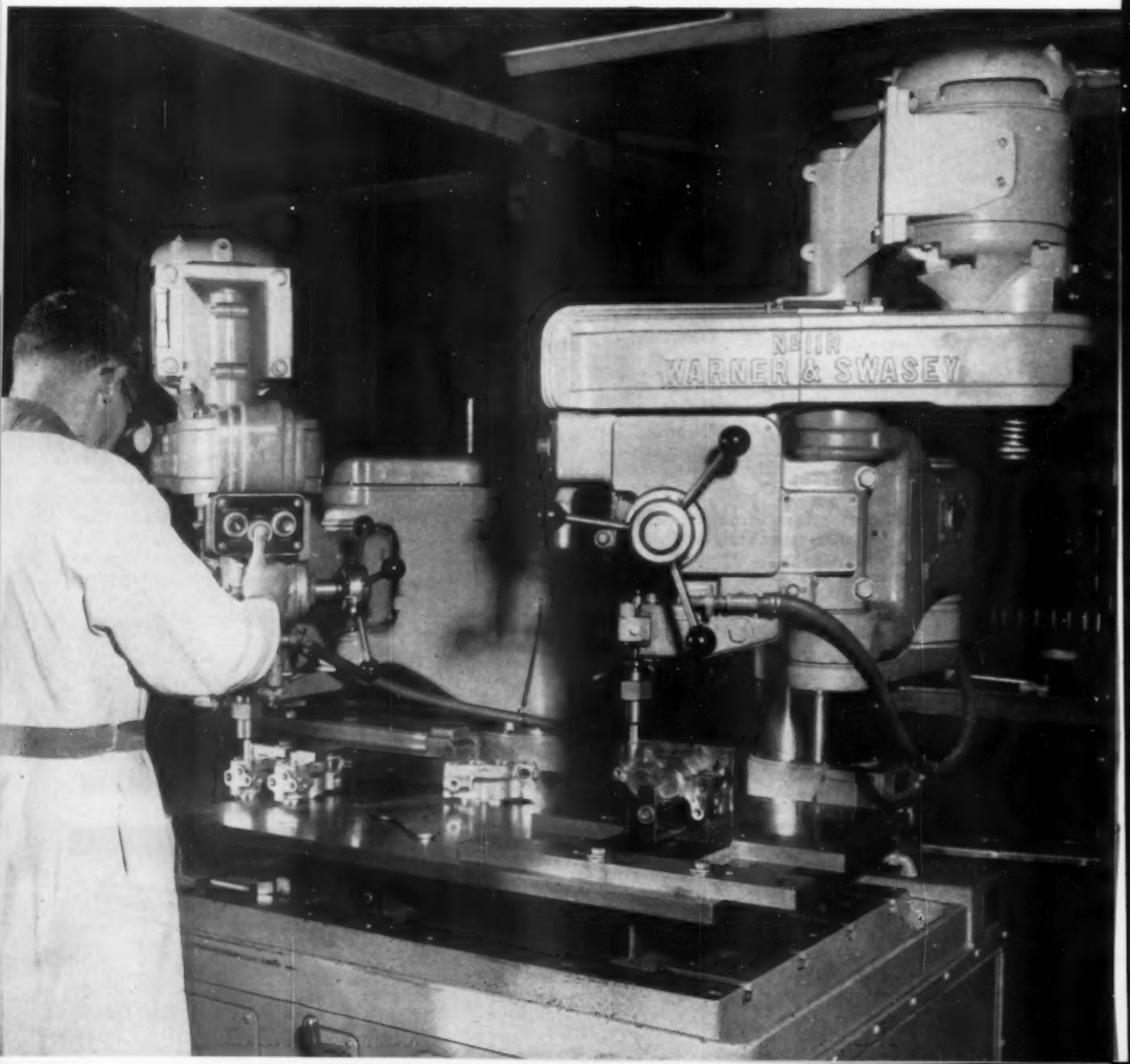
SUNDSTRAND MACHINE TOOL CO., ANN ARBOR, MICHIGAN

BROACHING TOOLS | THREE WAY | SINGLE RAM | HORIZONTAL | DUPLEX RAM | PRESSES

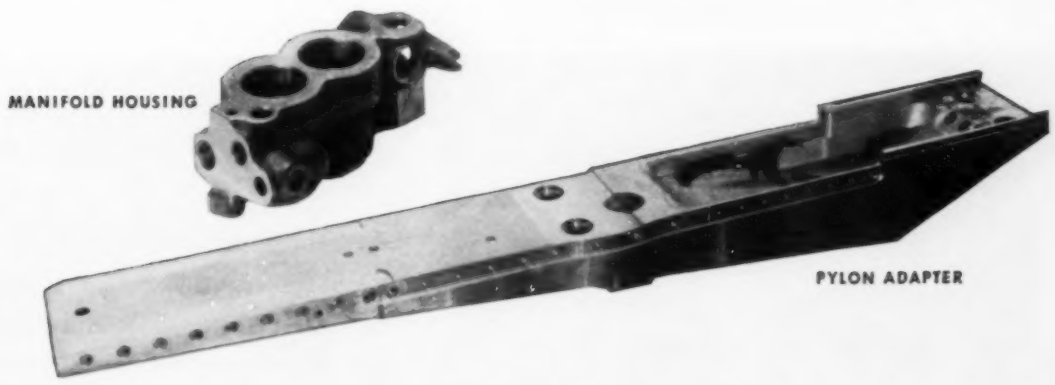
SUNDSTRAND "Engineered Production" Service

At C. L. Gougler Machine Co.

Warner & Swasey Precision production jobs to rigid aircraft



Radial Tapper easily handles specifications...eliminates scrap loss



Dual heads of their new Warner & Swasey 11 RD Precision Tapping and Threading Machine permit Gougler to tap holes at different levels—of different size or pitch—in the same workpiece without interrupting production flow. They report that blind holes and depth accuracy no longer present a tapping problem in their modern Kent, Ohio, contract plant.

Two interesting jobs are handled at Gougler. First is the Pylon Adapter (shown above) that's mounted under the wing of a fighter plane for ejection of fuel tanks. It's a 30-inch long aluminum forging that has had 30 costly machining hours before it reaches the Warner & Swasey Tapper. As it would cost over $300 to replace—scrap due to imperfect tapping would be extremely costly.

Lots consist of 197 sets—each having a right and left-hand part. Every piece has 35 blind holes tapped 5/16"-16, Class 3, 7/16" deep.

The second job—produced in 7,000-piece lots—is a Manifold Housing for a bomb and tank ejector. It's a tough SAE 4340 steel forging of 39-42 Rockwell. Four holes are tapped on the Warner & Swasey: three are 1/2"-20, Class 3; one is 5/8"-18, Class 3.

Production time per piece averaged 30 minutes when this job was rough-tapped on a drill press and finished by hand. Now, it takes only 4 minutes on the Warner & Swasey. Formerly, 4 pieces per 100 were scrapped—with the Warner & Swasey, not one piece has been scrapped.

If you need extreme threading accuracy on production jobs, then see your Warner & Swasey Field Representative. He will gladly discuss how to improve all your tapping operations—produce a better product. Of course—no obligation.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . .

WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

C. T. WEITZEL, President, Mechanical Specialties Co.
5700 West 96th Street, Los Angeles, California

a man who came to Fair Street

"We were skeptical of the claims for the JIGMIL Technique until we came to Fair Street. There we found the machine that met our need for accuracy and versatility with features to spare.

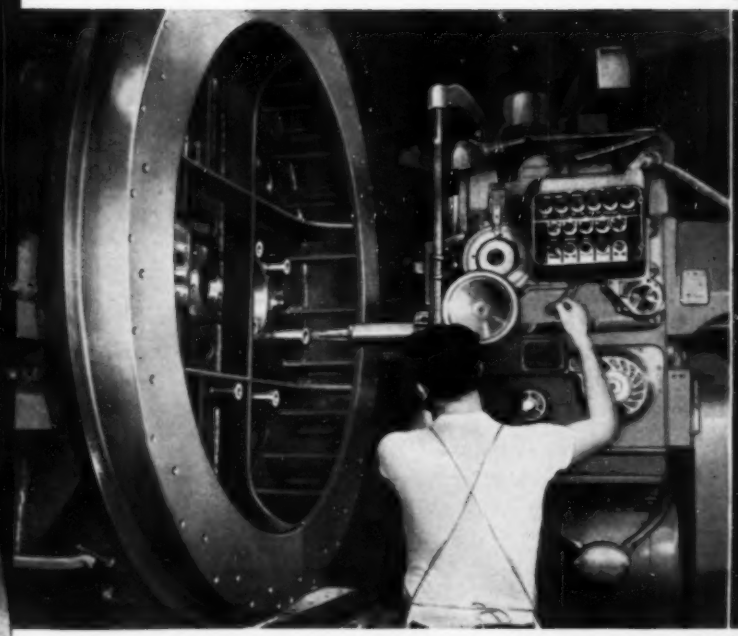
"As a contract manufacturer of tools, dies and precision components, we long felt the need for something new in the way of a precision boring and milling machine. Among other things, we wanted a machine having a configuration which would permit easy set-ups of a wide range of awkward and bulky work pieces. In 1946, we heard about the JIGMIL and the JIGMIL Technique of jigless boring. The claims for this machine were so unusual that we discounted much of what we heard, but decided that we should at least look into it. At Fair Street, we found the machine that met all our requirements with features to spare. Our first JIGMIL put us in a position to handle an entirely different class of work and without doubt, aided materially in our subsequent growth and development. Today, we have four JIGMILS which are consistently busy and consider them ideal job shop machines."

C. T. WEITZEL

DE VLIEG MACHINE COMPANY, 450 FAIR STREET

SOME OF OUR JIGMIL USERS

Airesearch Mfg. Co., Div. The Garrett Corp.
Bell & Gossett Co.
The Brush Beryllium Co.
H. W. Butterworth & Sons Co.
Byron Jackson Pumps, Inc.,
a Subsidiary of Borg-Warner Corp.
Cameron Iron Works, Inc.
The Cleveland Pneumatic Tool Co.
Delco-Remy Div. General Motors Corp.
Eastern Air Lines, Inc.
Euclid Div. GMC
Fairchild Camera and Instrument Corporation
General Atomic Div. General Dynamics Corp.
Goodyear Aircraft Corp.
C. L. Gougler Machine Co.
Greenlee Bros. Co.
Hoover Tool & Die Co.
Hughes Aircraft Co.
The Hydraulic Press Mfg. Co.
I-T-E Circuit Breaker Co.
Kaiser Industries Corp.
Koppers Co., Inc.
Kurt Mfg. Co.
Librascope Incorporated
Lycoming—Div. of Avco Manufacturing Corporation
Manning, Maxwell & Moore, Inc.
Massachusetts Institute of Technology
Maytag Co.
Menasco Mfg. Co.



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL PRECISION
applied to the guided missile program

Mechanical Specialties Co. uses the JIGMIL Technique for machining pieces such as this 3500 lb. traversing-launching ring for guided missiles. Part is set-up on a Model 3B-96 JIGMIL. Critical machining involves boring 24 indexing holes on a 60" dia. with hole spacing of ± .0005; an interior hole pattern of 5 holes coordinated to a master within ± .00025; 30 additional holes in a 30" x 36" rectangular pattern to ± .001; accurate milling of locating pads and boring of 3 large critical bores to ± .001.

McKiernan-Terry Corporation
National Cash Register Co.
Norden-Ketay Corp.
Robbins & Meyers, Inc.
Rocketdyne Div., North American Aviation, Inc.
Rohr Aircraft Corp.
AC Spark Plug Division, General Motors Corp.
Sperry Farragut Co., Division of Sperry Rand Corp.
Stratos Div. Fairchild Engine & Airplane Corp.
Sundstrand Machine Tool Co. (Aviation Div.)
Sylvania Electric Products, Inc.
Utica-Bend Corp., a Subsidiary of
Curtiss-Wright Corporation

WILL YOU BE THE NEXT TO VISIT FAIR STREET

Our newest catalog will help you decide. May we send it?

DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

FERNDALE • DETROIT 20

In the high-grade camera field

this LAPOINTE

BROACHING PRESS

does "push ups" for profit . . . and helps to make the camera, itself, "pretty as a picture"!

To substantially improve the appearance of their product, one well-known manufacturer of a quality camera now Lapointe-broaches the external grooves on a lens attachment to a *16-microinch finish.* Using proper dies and fixture adapters, this same machine will broach a filter attachment, outer lens barrel, lens attachment body, focal length control sleeve . . . and similar parts of the same general size and configuration.

Lapointe-Broaching is the modern method of metal removal. It has so many advantages that it is replacing "conventional" processes such as milling, grinding, shaping, etc. in numerous applications. It's challenging the thinking of every good production man, because he knows that *obsolescence strikes at methods just the same as at machines!*

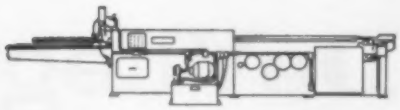
What is the production picture in your plant — is it sharp or is it fuzzy? If you suspect that your costs and methods are out of focus, a brief exposure to a few facts presented objectively by a qualified Lapointe Field Engineer may develop some colorful production possibilities. Why not ask him to call?

THE LAPOINTE MACHINE TOOL COMPANY

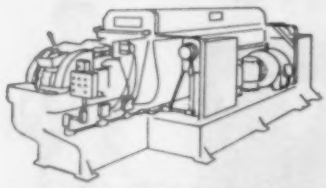
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

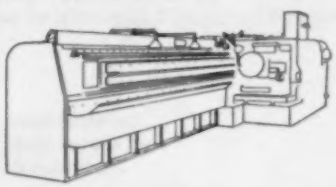
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC



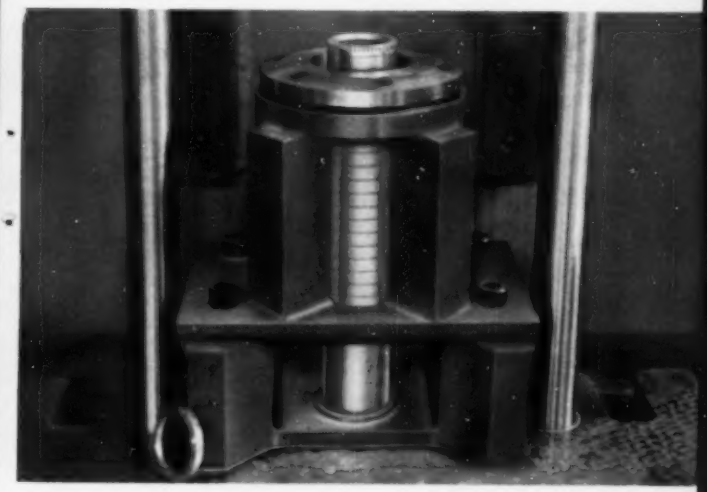
CH CONTINUOUS BROACHING, ELECTRIC



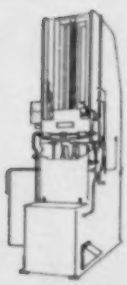
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

Before ..... and after broaching

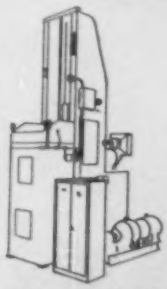
Borrowing a phrase from the camera manufacturers, this Lapointe Broaching Press is indeed "easy to load, easy to unload". Five-ton capacity, 24-inch stroke. Pot type die holder accommodates interchangeable sets of broach dies.



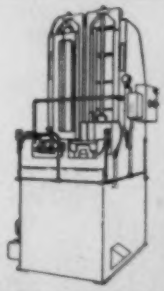
Lapointe engineering is responsible for the simple, practical "push up" approach which solved this broaching problem. The part is loaded with the ram in the down position, then is **pushed upwards** through the broaching dies, and is removed at the top of the fixture. Production is 320 parts per hour, at 80% efficiency.



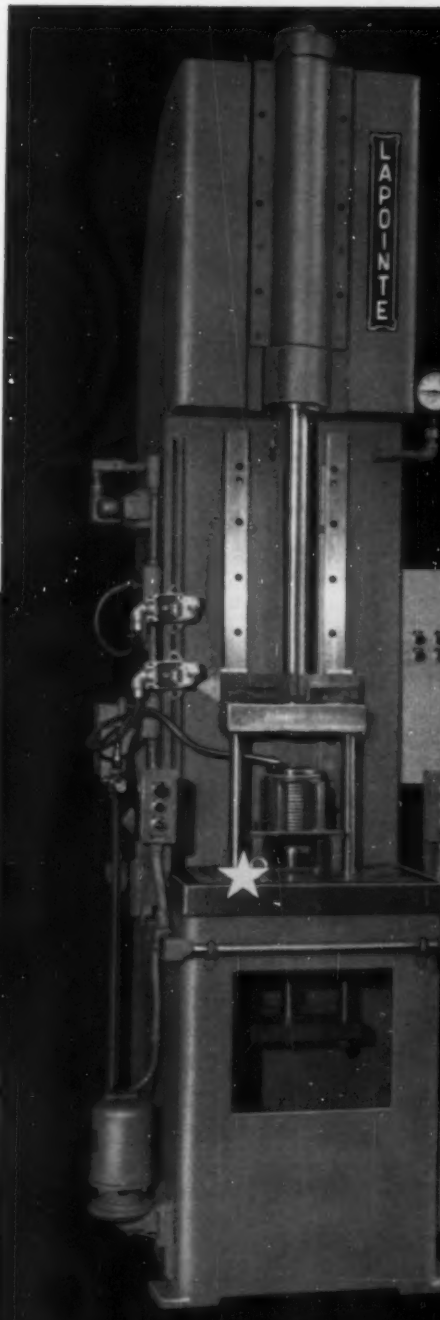
VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



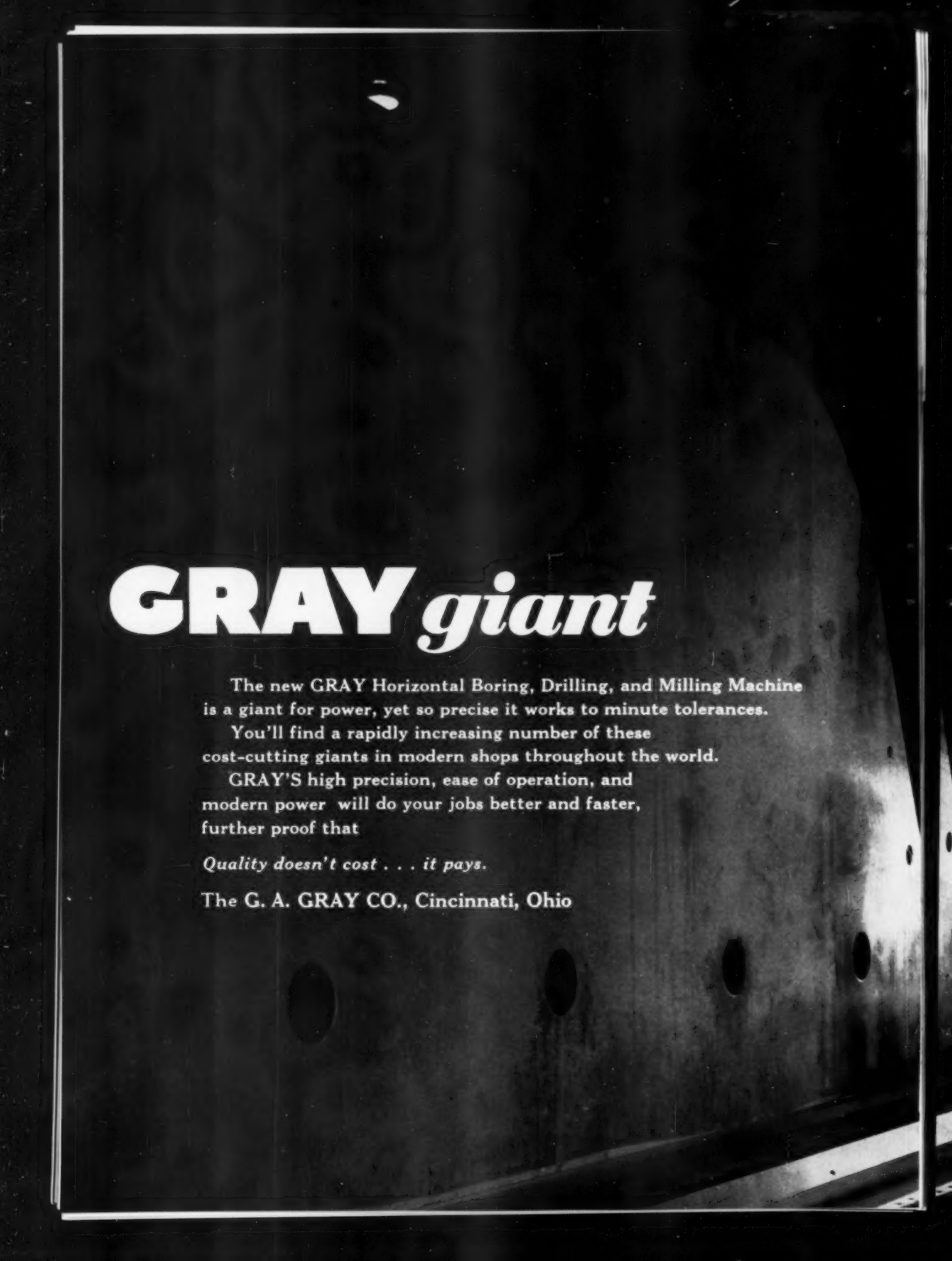
DRVE DOUBLE RAM VERTICAL, ELECTRIC

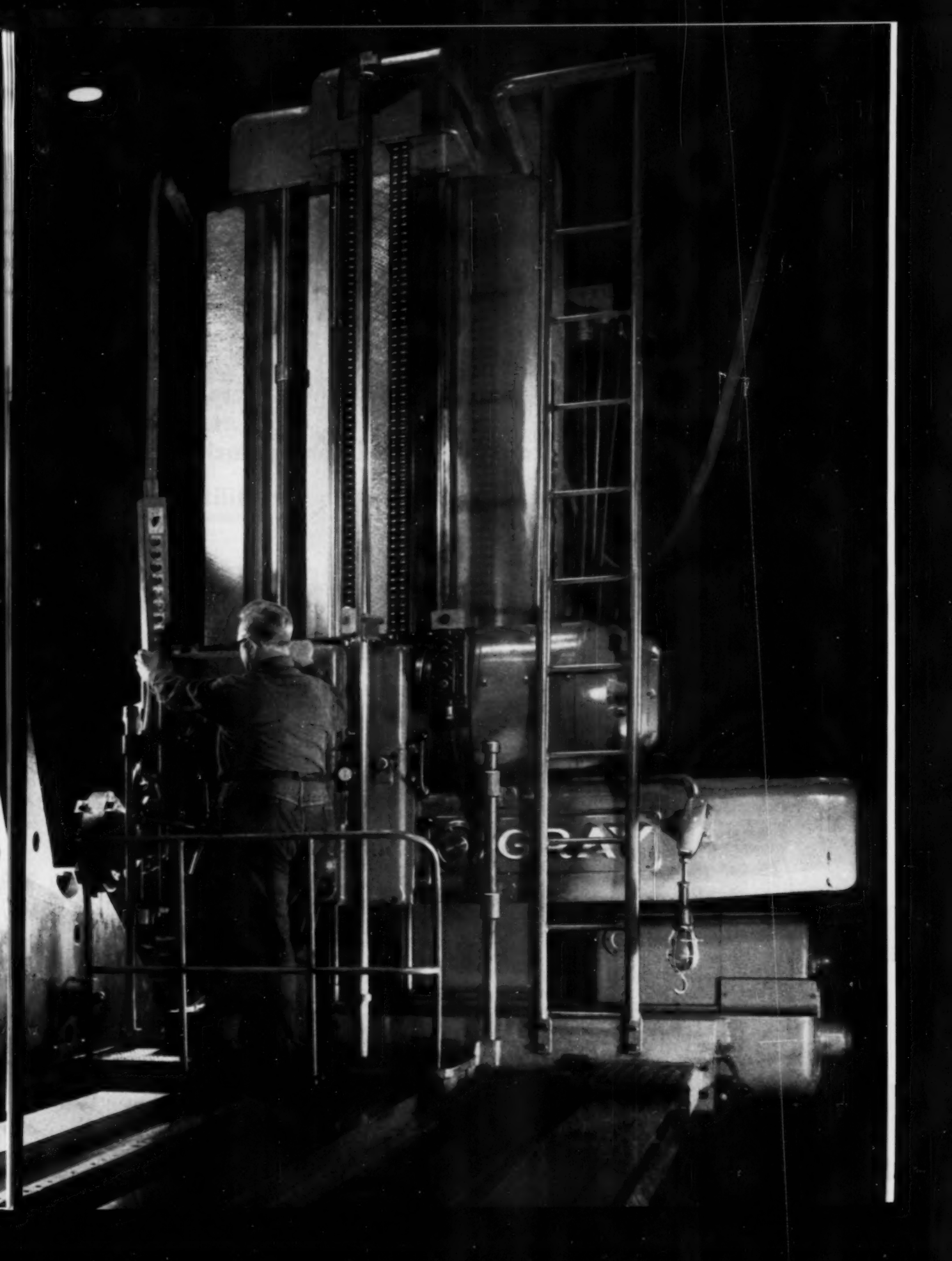


LAPOINTE

known to be the best in

BROACHING


GRAY giant
The new GRAY Horizontal Boring, Drilling, and Milling Machine is a giant for power, yet so precise it works to minute tolerances.
You'll find a rapidly increasing number of these cost-cutting giants in modern shops throughout the world.
GRAY'S high precision, ease of operation, and modern power will do your jobs better and faster, further proof that
Quality doesn't cost . . . it pays.
The G. A. GRAY CO., Cincinnati, Ohio



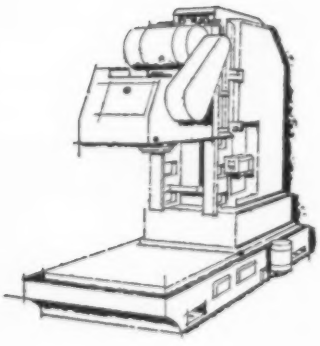
News in Machine Tools

New M & M Vertical Drilling and Boring Machines team ruggedness with application versatility

Heavy duty drilling and boring are a snap for these new M & M machines. And talk about versatility! By accommodating many types of heads, fixtures, indexing tables and bases, these units are adaptable to a truly wide variety of machining operations.

Automatic cycle includes rapid traverse down, feed and rapid return. Variations of this automatic cycle are available. Other vital statistics include:

- up to 60 HP capacity
- available in 15″ and 30″ stroke
- vertical slide 26″ wide, 48″ long, 20½″ across the ways
- positive cam-actuated feed valves
- slide-mounted cams for speedy stroke setting changes
- column can be arranged with a variety of risers for wide range of large work



Models of this machine are available to suit your problem.

Find out how this versatile metalworking machine can add flexibility to your present machining operations. Contact your nearby Motch & Merryweather representative, or write: Motch & Merryweather Machinery Company, 1250 E. 222nd St., Cleveland 17, Ohio.

BUILDERS OF AUTOMATIC PRECISION CUT-OFF,

MOTCH AND MERRYWEATHER

Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

MILLING, DRILLING AND SPECIAL MACHINERY

U. S. Steel Supply's Special Services "increased our production 100%"

says **E. M. Tucker, President,** Tucker Sno-Cat Corporation, Medford, Oregon

"Our annual volume has doubled to $1,000,000 in the two years we have utilized U. S. Steel Supply's Special Services," says Mr. Tucker.

"Prior to dealing with U. S. Steel Supply, we had been forced to use an unsatisfactory grade of steel on our equipment. We realized that a tougher grade of steel was needed. However, to cut this stronger material to size we needed a $150,000 plate shearing press. This was an expense we couldn't afford.

"But through U. S. Steel Supply's technical assistance, we discovered the value of COR-TEN Steel and now use it on the underside of our pontoons. And, because of U. S. Steel Supply's cutting equipment, these sections arrive at our plant pre-cut and ready for installation.

"Results have been startling! Our product, which had been limited to operating only over snow and ice because of weak pontoon undersides, now travels without damage over mud, muskeg and bare ground.

"By making us aware of the advantages of tough, abrasion-resistant COR-TEN Steel, U. S. Steel Supply helped us produce a better product. We consider U. S. Steel Supply directly responsible for our increased production and rapidly expanding market."

U. S. Steel Supply offers this same metallurgical assistance to you, *plus* the availability of flame-cutting, shearing, slitting and coiling equipment. If you want one of our representatives to show you how to benefit from these Special Services, write to U. S. Steel Supply at the address below.

USS and Cor-Ten are registered trademarks

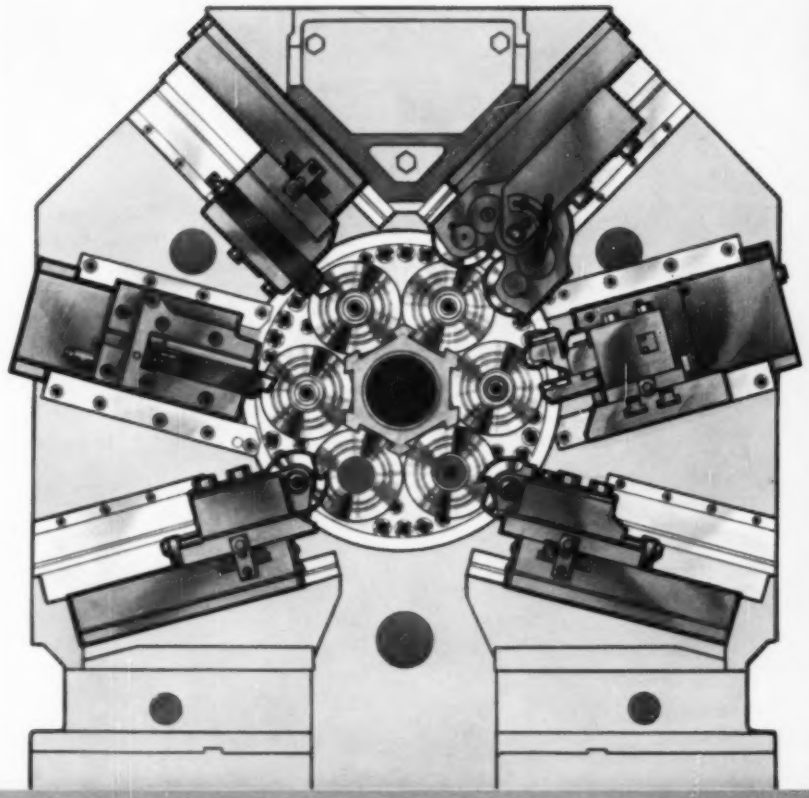
U. S. Steel Supply
Division of USS **United States Steel**

Steel Service Centers Coast to Coast • Mailing Address: P. O. Box 1099, Dept. W6, Chicago 90, Ill. • General Offices: 208 So. La Salle St., Chicago 4, Ill.

Look at New Britain's

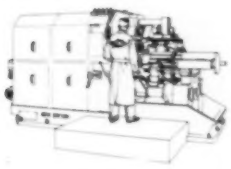
new cross slide arrangement

Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.

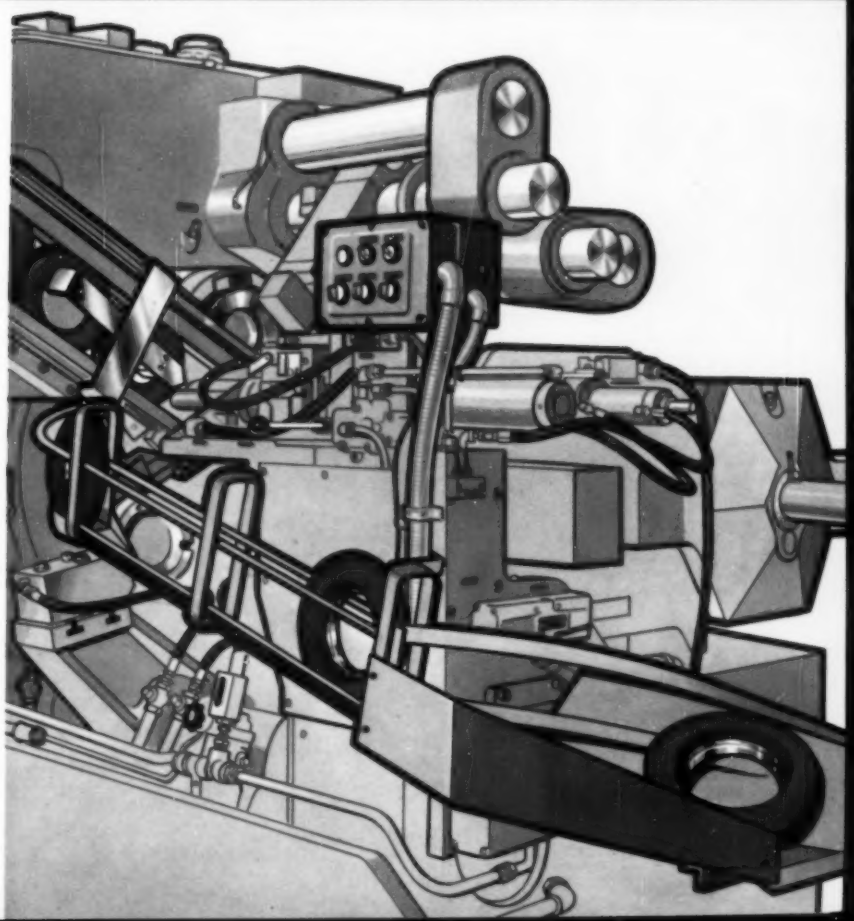


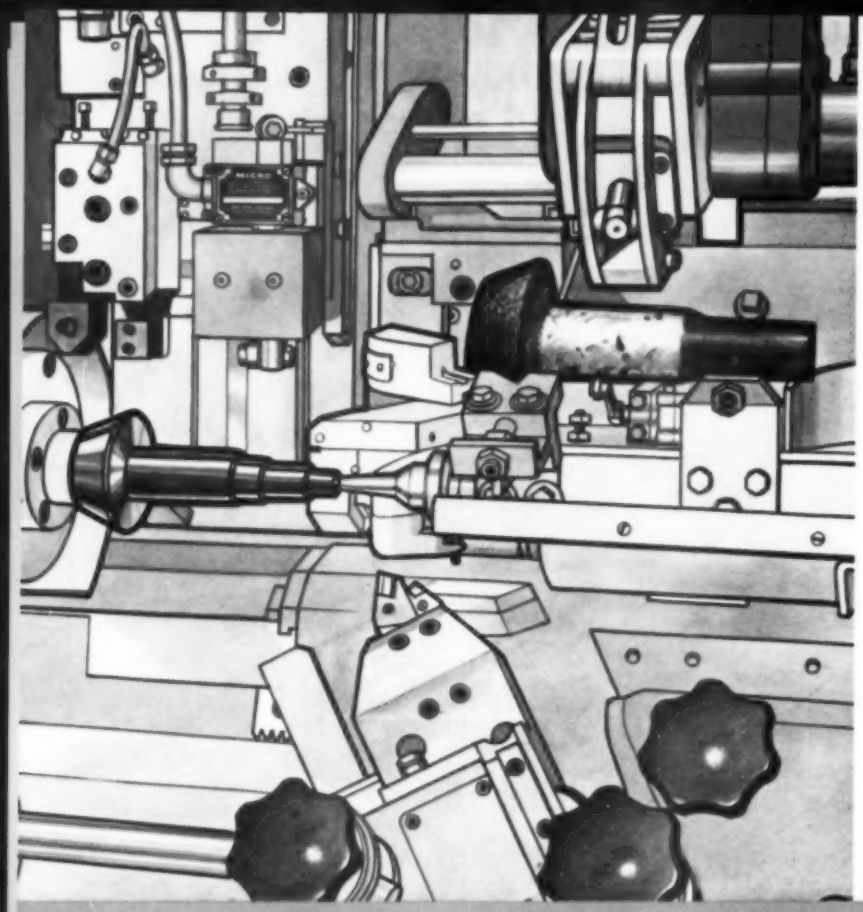
Look at New Britain's

open-end chucker design

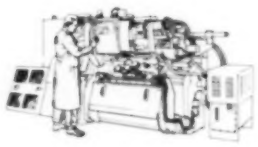


Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

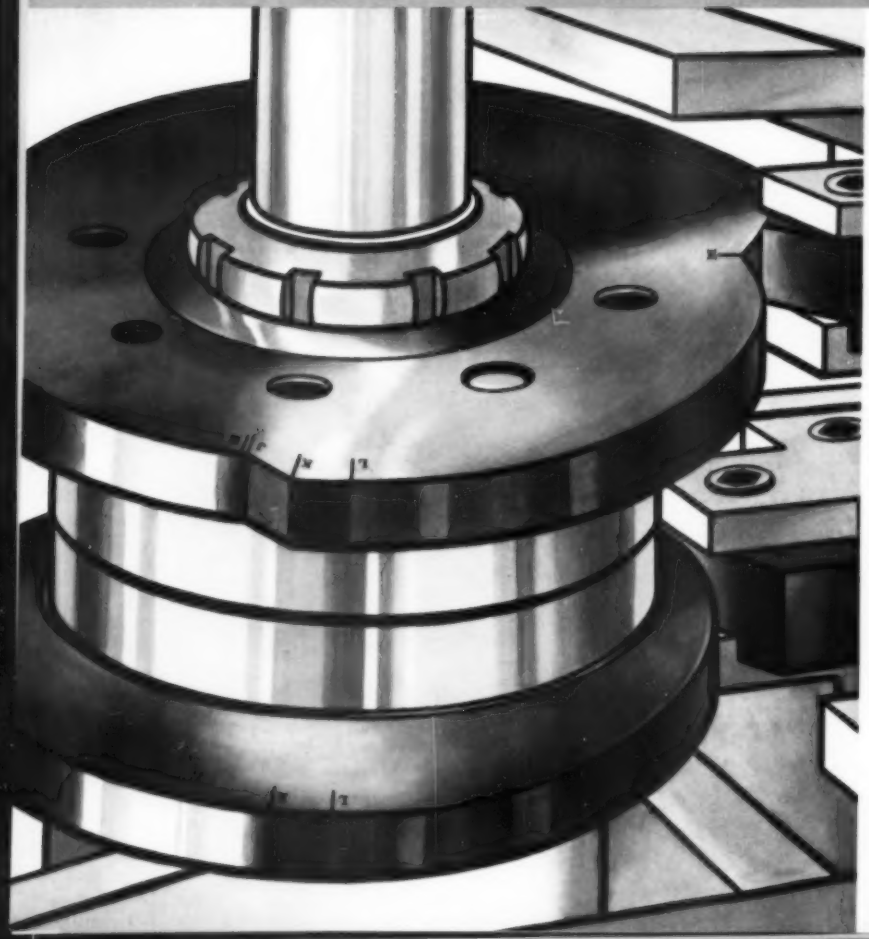




Look at
Automatic Loading on
New Britain +GF+



This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.



Look at New Britain's
cam-controlled boring machine

When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

This is an ideal time to have new-machine accuracy rebuilt into your New Britains by New Britain

Ruggedness and dependability have been built into every New Britain machine ever sold. For a fraction of the replacement cost you can have your older New Britains restored to new-machine accuracy. Rebuilding eliminates the high cost of frequent shutdowns and returns the machine to full efficiency, performing every operation it was designed to perform.

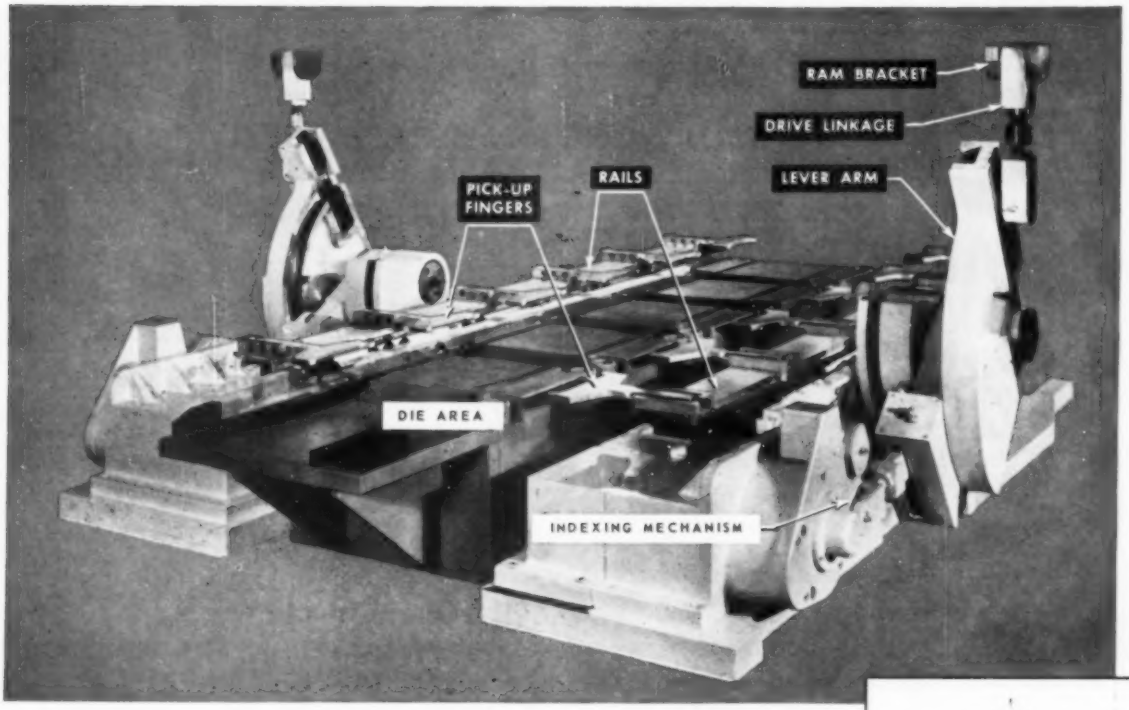
At New Britain your machines will be rebuilt with the same production facilities that originally built them. Established reconditioning procedures, based on long experience, will put your rebuilt machines back on the line in the shortest possible time. Wherever possible, your machine will have the benefits of the newest improvements in parts and assemblies.

With New Britain your rebuilt machines carry a new-machine warranty.

Your New Britain field engineer or sales representative will help you determine the rebuilding program best suited to your needs. Call him, or write or phone the factory direct, c/o Service Sales Manager, The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

SHEFFIELD PRESS-PACERS

SUBSTANTIALLY INCREASE PRESS OUTPUT



The Sheffield Press-Pacers are all readily demountable transfer mechanisms used to automate one or a line of straight-side presses.

Any number of transfer operations within press capacity may be included. Thus, one press can be made to do the work of several.

Coil stock, blanks or pre-drawn work parts may be handled with equal facility.

OPERATION

The Press-Pacer receives the work and advances it from die to die and from press to press—all automatically.

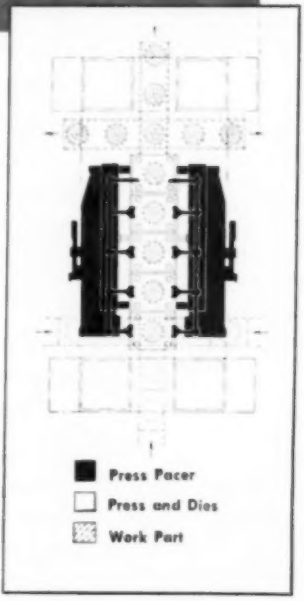
Work parts may be traversed in any desired direction—front to back, right to left or the reverse.

PRODUCT CHANGE DOES NOT OBSOLETE THE PRESS-PACER

Feed fingers are interchangeable and easily replaced when the product is changed. Traverse distance between dies and between presses is fully adjustable to changed requirements.

Installation of the Press-Pacer can be done in just a few hours. It may be removed from a press in a matter of minutes.

8005



Write for **Catalog No. PP3M-57 to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.**

the **SHEFFIELD** *corporation*
of Bendix Aviation
manufacture and measurement for mankind

GUARANTEED PURITY!

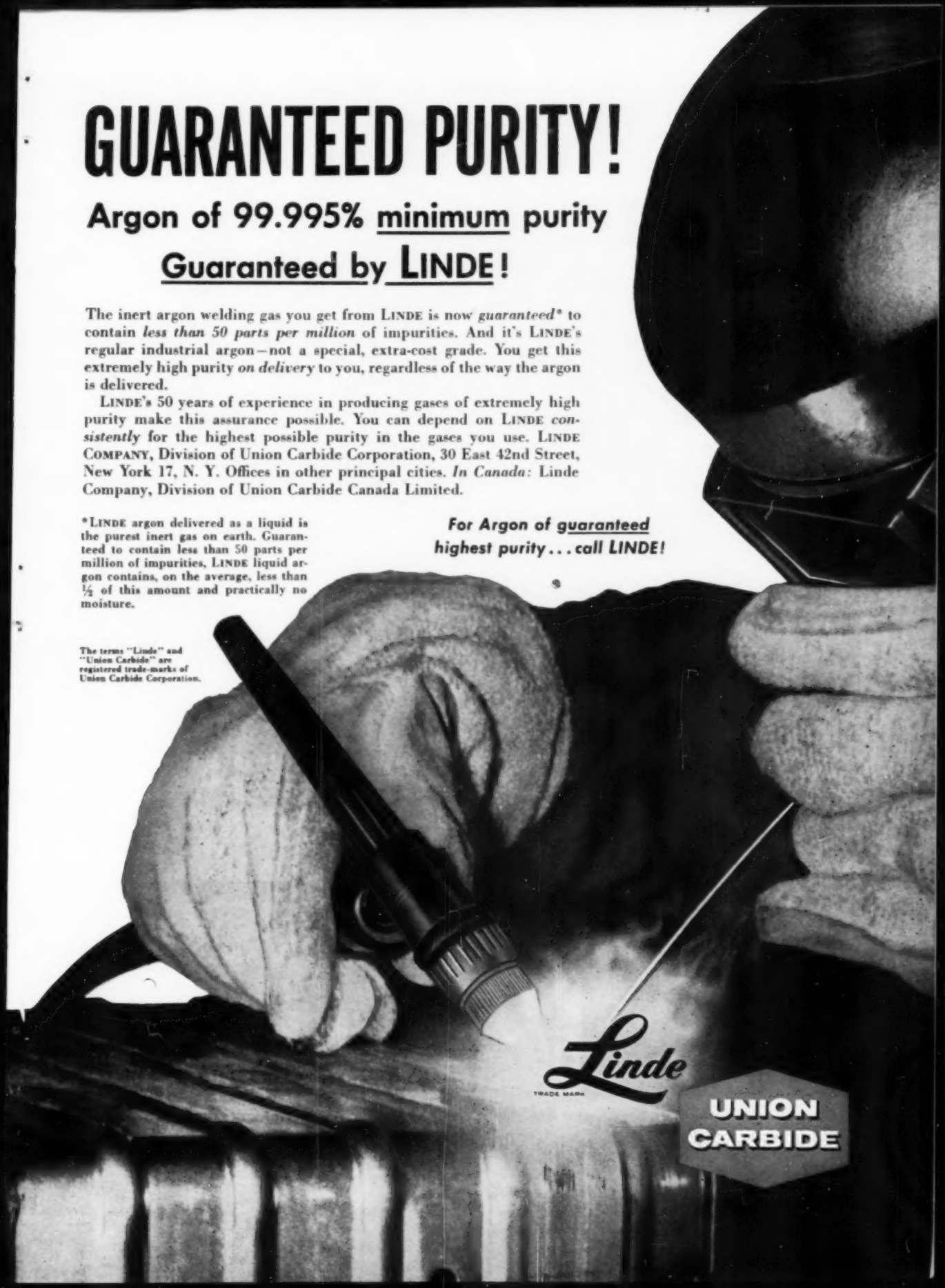
Argon of 99.995% minimum purity Guaranteed by LINDE!

The inert argon welding gas you get from LINDE is now *guaranteed** to contain *less than 50 parts per million* of impurities. And it's LINDE's regular industrial argon—not a special, extra-cost grade. You get this extremely high purity *on delivery* to you, regardless of the way the argon is delivered.

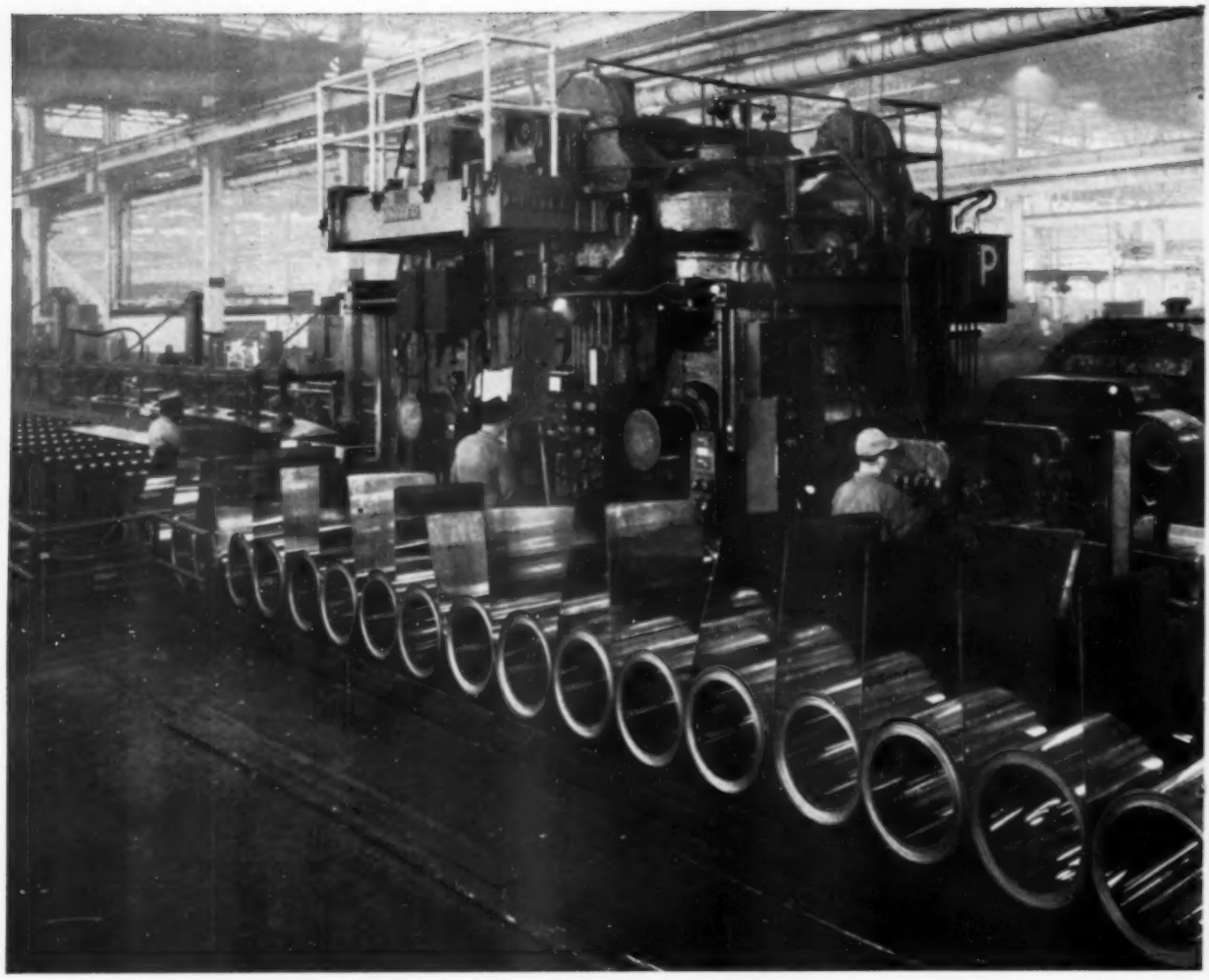
LINDE's 50 years of experience in producing gases of extremely high purity make this assurance possible. You can depend on LINDE *consistently* for the highest possible purity in the gases you use. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

*LINDE argon delivered as a liquid is the purest inert gas on earth. Guaranteed to contain less than 50 parts per million of impurities, LINDE liquid argon contains, on the average, less than ½ of this amount and practically no moisture.

For Argon of guaranteed highest purity . . . call LINDE!

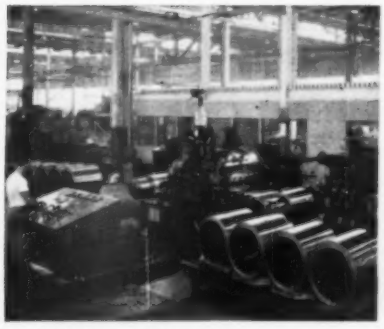


The terms "Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

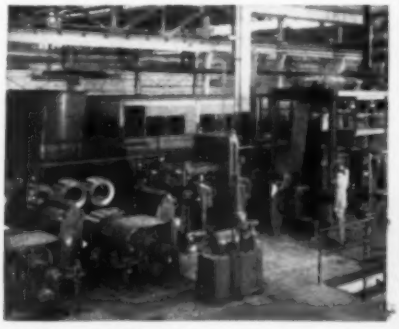


PAIRED FOR PRODUCTION, this tandem 4-High Cold Rolling Mill processes metal bar into workable sheets—operates at higher speeds to match the requirements of other new production machinery.

ONLY ONE OF ITS KIND, this new Chase Mill has the finest electronic and automatic controls available, to assure careful control of surface, gauge and quality.



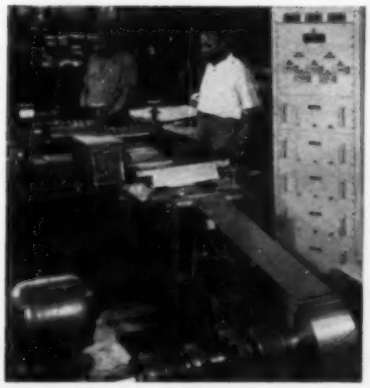
PRECISION FINISHING of sheet and strip is produced by this Sendzimir Rolling Mill —assures you of highest quality in your own finished products.



KEEPING TEMPER is the assignment of this combination strip cleaning, annealing, pickling and drying-out line in the new Chase production facilities.

The Nation's Headquarters for Brass, Copper and Stainless Steel

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles



NOT EVEN A PIN-HOLE gets by the electronic eye of this quality-control machine. Result—high quality to end costly rejects on your production line.

UNRIVALED SHIPPING *and Handling Facilities* assure quick handling and delivery ready for use. Note care Chase takes in packaging to protect the metal.

Now you get these 5 big advantages from ultra-modern facilities at Chase Brass!

1. You can now buy heavier coils—up to 100 lbs. per inch of width in unwelded brass and up to 180 lbs. per inch of width in copper. Longer coils match requirements of modern high-speed production equipment in your plant.

2. You can count on the best surface ever! Special mills now used are designed to produce unrivaled surface quality in both sheet and strip.

3. You can be sure of maximum gauge control. Ultra-modern electronic and automatic controls protect close-tolerance gauges from end to end of every strip.

4. You're assured better-than-ever annealing! New continuous strip annealing and bell-type annealing furnaces protect grain size and surface quality far better.

5. You can rely on delivery matched to your own production-line requirements! Automation, speeded-up operations, faster output all combine to guarantee quicker quantity deliveries.

OUT OF A PICKLE! Controlled inert gas atmosphere in new bell-type furnaces eliminates need for intermediate pickling.

Chase

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT

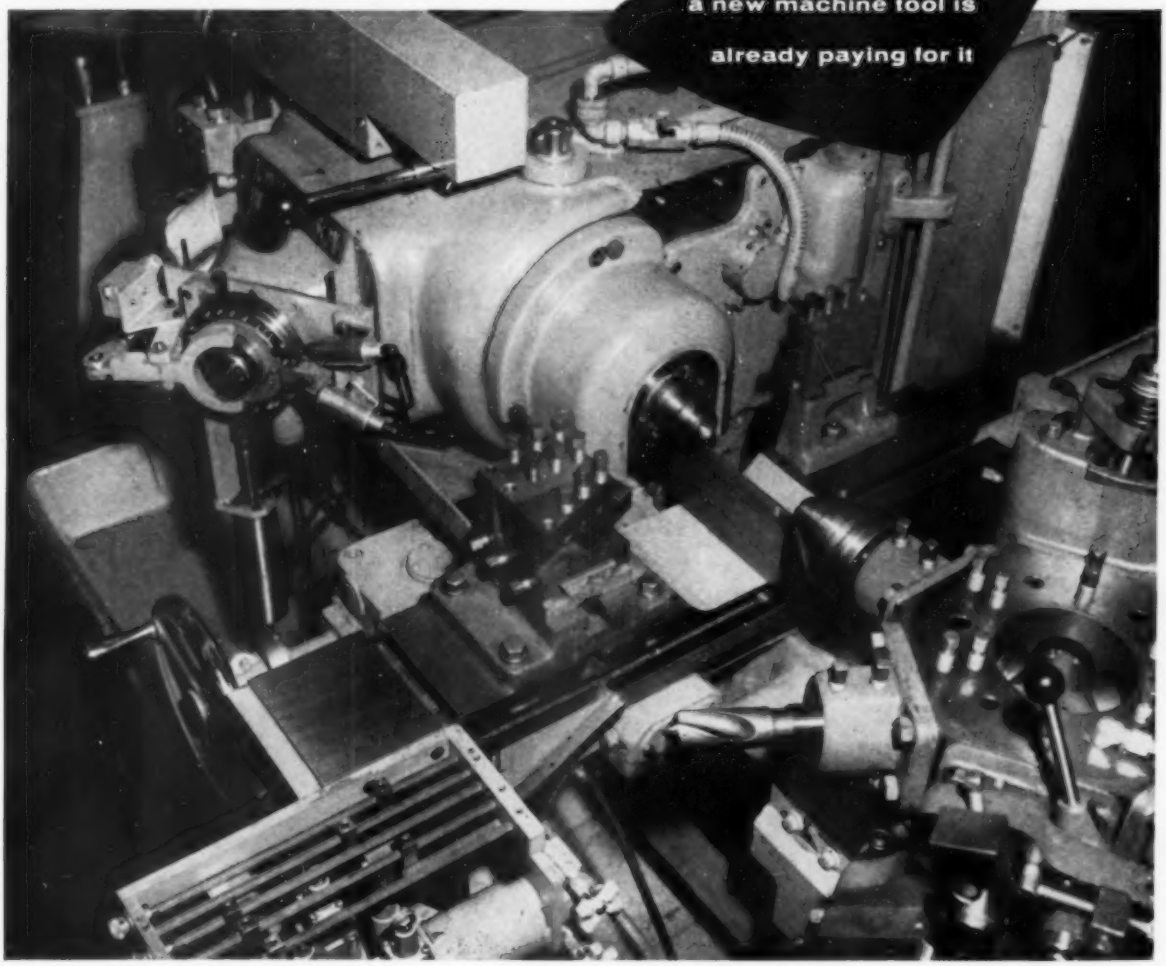
Subsidiary of ***Kennecott Copper Corporation***

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L. I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

JONES & LAMSON "AUTOMATION"

the man who needs a new machine tool is already paying for it



Where's the Operator?

And for that matter, where's the speed selector? The answer is that they're both absent, because this is a *completely automatic* production operation. It's a custom installation of a Lynn Hydraulic Drive on a Jones & Lamson ram type turret lathe.

This assembly provides fully automatic cycling for both long and short runs. The turret drive provides for rapid approach to the work, variable feeds, controlled dwell, reverse feed, and rapid return of the turret. The cross slide has automatic cross travel in both directions. Feed ranges for the cross slide drive are equivalent to those of the turret drive.

Spindle speed selection, start, stop and reverse are all automatic. Operation of collet chucks and bar feed is also automatic for a continuous repetitive cycle.

Two typical set-ups increased production 26% per machine. One operator handled both machines with ease. Investigate how you can get similar results. Write for literature — Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

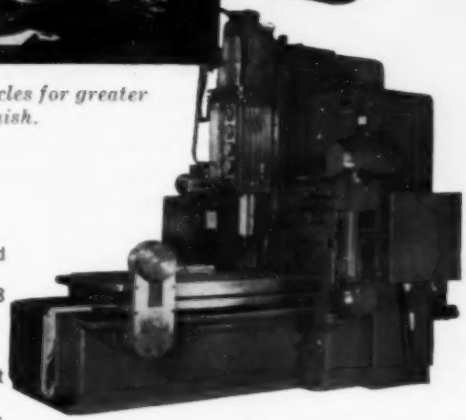
Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Reduce Costs Increase Efficiency

DIGIMATIC

contour control system for machine tools

EXCLUSIVE! *Cuts true circles for greater accuracy and smoother finish.*



FAST...
- 3½ hours from blueprint to finished piece... for a typical part.
- Director prepares ½" tapes at 8 times cutting rate.

ACCURATE...
- Closed loop servo provides constant check on position.
- Automatic slow-down on inside cuts prevents over-shoots.

ECONOMICAL...
- Lowest cost control system, both in purchase price and in operating expense.
- Keyboard "Programming" by machine shop personnel.
- Eliminates cost, maintenance and storage of "hard" tooling.
- Shortens lead times and reduces first-part cost.

INVESTIGATE THE DIGIMATIC 180 MILLING MACHINE CONTROL!

It's the lowest priced, easiest to operate high-performance contour control system you can purchase today. Commercial deliveries are now being made.

Control illustrated is now in use at Convair-San Diego. This is the first of fifteen DIGIMATIC 180's combined with Morey A50 contour milling machines being delivered to Air Force contractors.

Provides three-axis coordinated control with 100-inches per minute (max.) cutting rate. (±0.001 inch tolerance.) Compact: 48" wide x 35½" deep x 61" high.

DIGIMATIC Controls are now available on a number of well-known machine tools in a variety of sizes.

Write for 16-page, illustrated Brochure giving complete details and specifications.

ECS

ELECTRONIC CONTROL SYSTEMS

Division of

STROMBERG-CARLSON COMPANY

A DIVISION OF GENERAL DYNAMICS CORPORATION

2231 South Barrington Avenue, Los Angeles 64, California

New

ARMSTRONG

Armide CARBIDE INSERT TOOL HOLDERS

STYLE TR
(opposite Hand TL)
Holds Triangular 6-edge, Armide and other carbide "throw-away" inserts.

STYLE SR
(opposite Hand SL)
Holds square, 8-edge, Armide and other carbide "throw-away" inserts.

Buy **ARMSTRONG TOOLS** from your Industrial Distributor

Write for catalog

Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD—speeds indexing of Inserts.**
- **REPLACEABLE SEAT of Hardened Tool Steel—protects shank and provides flat base to prevent damage to inserts as they are clamped in position.**
- **SHANK of Heat Treated Alloy Steel—gives extra strength and rigidity.**

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

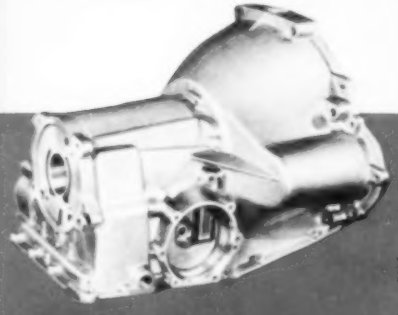
W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

EX-CELL-O Precision Production News

COST-CUTTING IDEAS FROM EX-CELL-O CORPORATION — DEVOTED TO MINIMIZING COST OF PRODUCTION

Over-all view of 24-station, 75-foot long transfer machine looking from loading end. A typical high production automation machine by Ex-Cell-O.

58-31A



Aluminum automobile transmission case after automatic precision boring, tapping, precision fly cut milling, gaging and flushing on Ex-Cell-O Transfer Machine.

120 parts per hour —automatically!

24-station transfer machine performs multiple machining of automotive transmission housings in high-speed, automated production . . .

At the touch of a button, this Ex-Cell-O Transfer Machine turns aluminum castings into finish-machined automatic transmission housings at a rate of one every 30 seconds.

From its first-station loading, through complex machining operations, to its unloading section 24 stations later, this 75-foot-long unit produces labor savings, time savings and precision parts —automatically.

Machining steps include semifinish-and-finish facing, precision boring at five different stations, tapping and precision fly cut milling. Air gages monitor all boring operations and parts are oriented automatically—turned 90° for boring at one station, inverted 180° at another for milling on four surfaces.

Ex-Cell-O Transfer Machines may be the high-production answer to your manufacturing problems. See your Ex-Cell-O Representative, or write direct for further information.

3 MORE COST-CUTTING IDEAS

The precise answer to higher production

When product demand goes up, versatile Ex-Cell-O Duplex Machines answer the problem of supply

A large auto manufacturer recently increased production of torque converter housings *automatically* by using three Ex-Cell-O Style 432 Duplex Vertical Boring Machines.

Two double-station machines finish-face the engine-mounting end of the cast-aluminum housings, and semi-finish the opposite face. The third machine is tooled to finish-face the transmission-mounting end and to bore and chamfer a 7.003″-7.006″ hole.

Ex-Cell-O Duplex Machines also perform such operations as precision turning and grooving; stations can be operated independently for different parts and operations, or set up for identical operations.

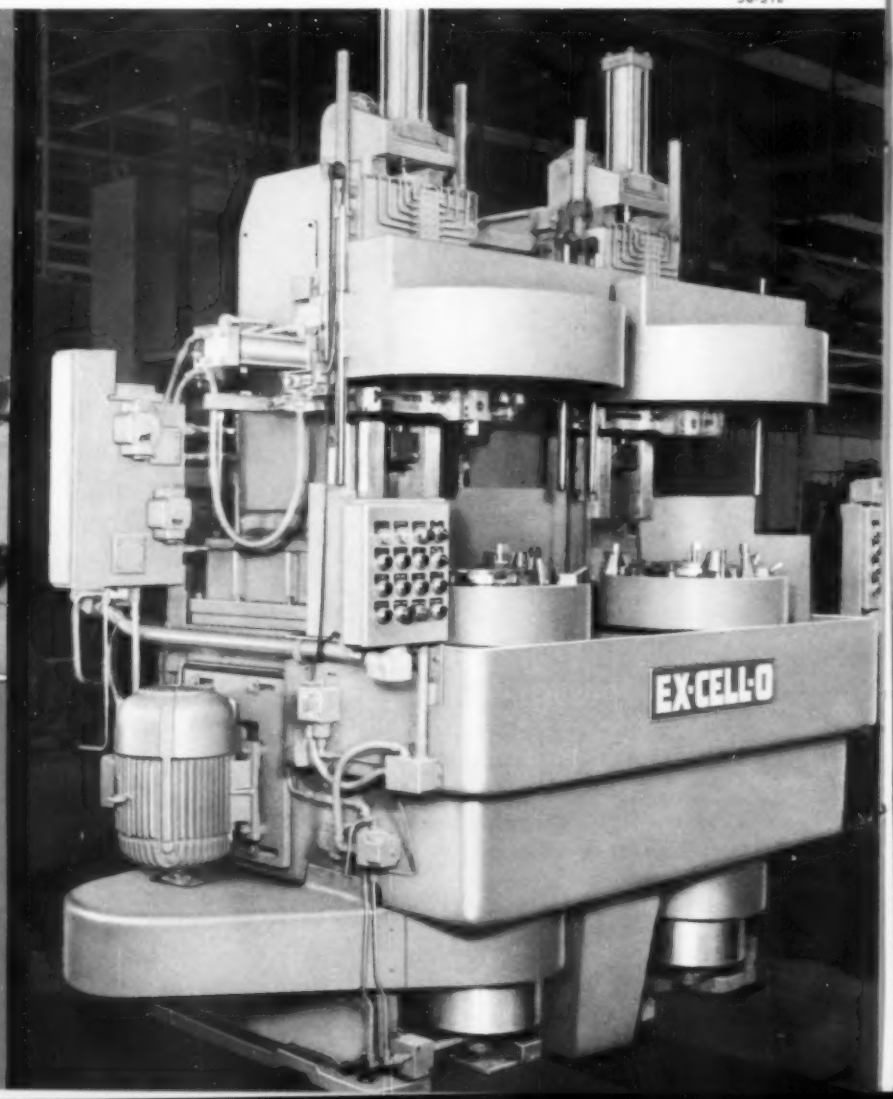
Find out how Duplex versatility can increase precision production in your plant: Call your local Ex-Cell-O Representative today, or write direct.

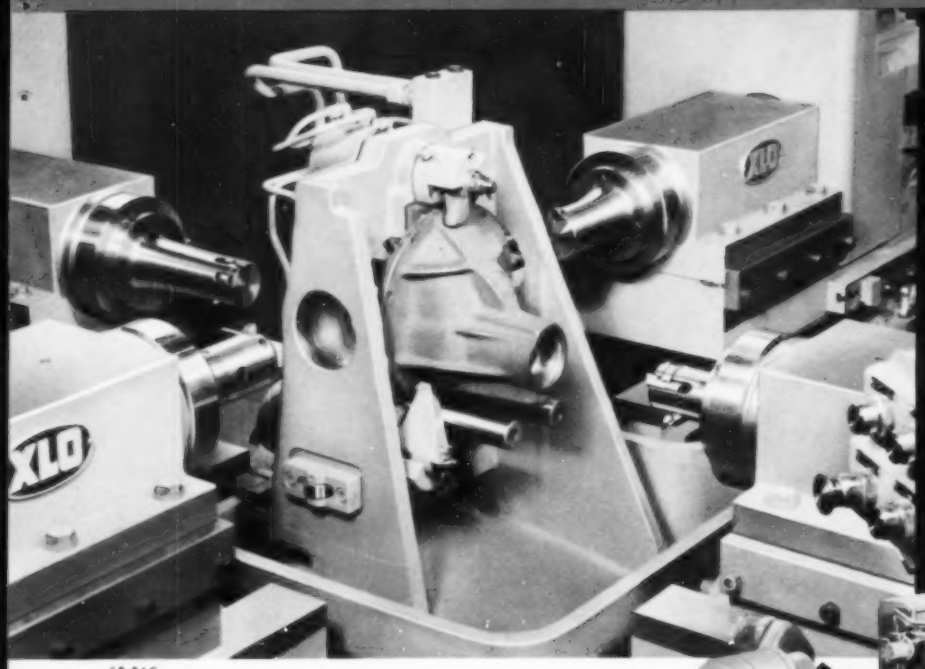
58-318

Aluminum torque converter housing, shown after machining, is completely roughed and finished at both ends and chamfered and bored by three Style 432 Duplex Vertical Machines.

Above: **At station 1 (left) part is semi-finish-faced on the transmission end by one tool; at station 2, the engine-mounting end of the part is finish-faced by two tools making a single pass.**

Right: **Duplex Vertical Boring Machine is used for high-volume production of automatic transmission housings. Style 432 performs various machining operations alone or in any combination.**

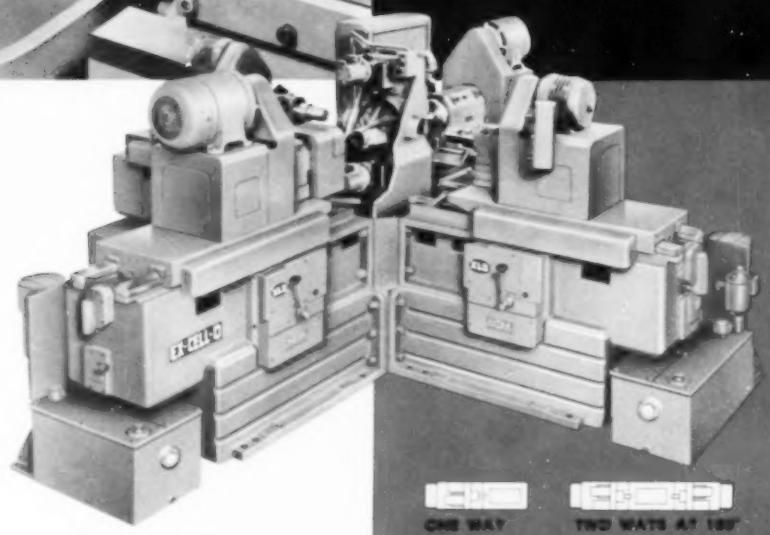




Close-up of 4-way machine shows Ex-Cell-O Precision Spindles used to assure accurate boring of pinion bearings and cross-holes in an automotive differential housing.

Below: Working simultaneously from four directions, this Ex-Cell-O Way-type Machine is made up of four standard units joined with a standard center section for precision location of the workpiece and precise 90° relationship between spindles.

58-31C



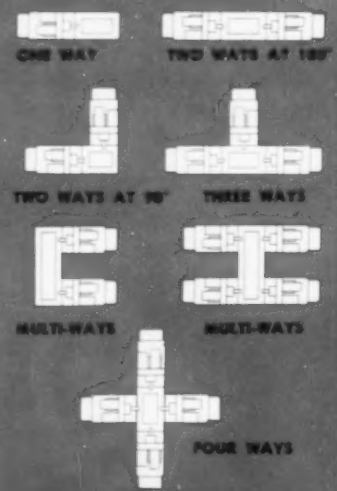
Operations Combined to Boost Profits

4-Way Precision Boring Machine works simultaneously from 4 directions for fast, accurate production

The differential carrier assembly above is typical of parts machined quickly, easily and economically on Ex-Cell-O Way-type Machines. On this particular job, bore relationship is maintained at a true 90° and bore diameters are held as close as .0005".

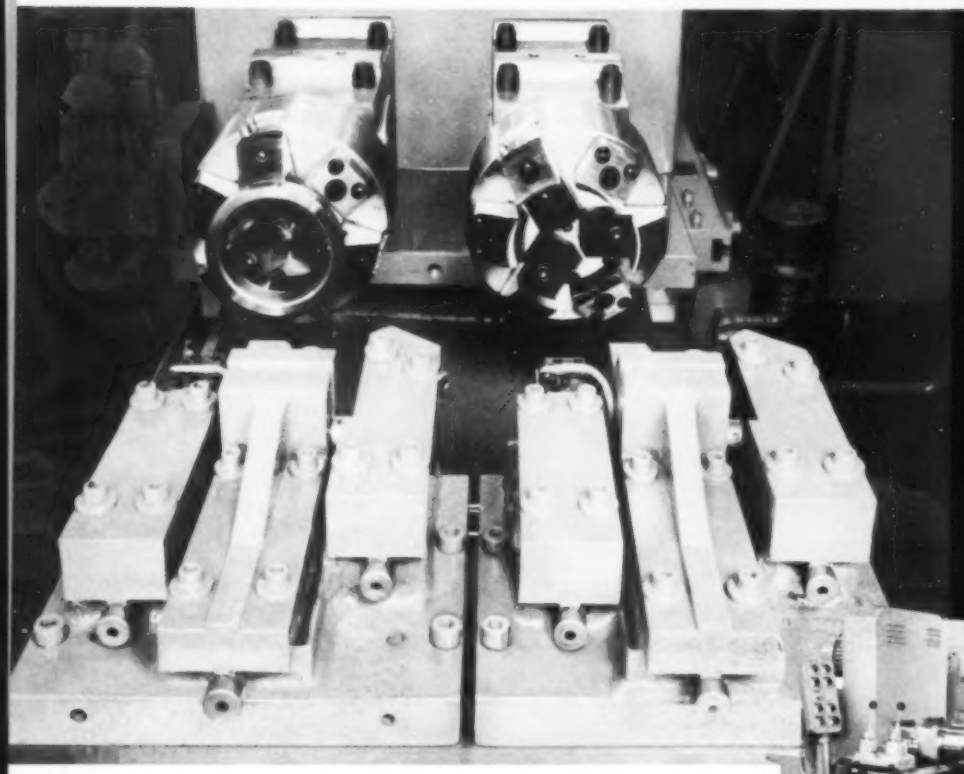
Ex-Cell-O Way-type Machines consist of standard units combined into a single machine with a standard center section for precise, simplified parts location. They can be used singly or utilized in fully automated lines.

If your production plans—present or future—demand utmost accuracy with high output, look into the many advantages of Ex-Cell-O Way Machines by calling your local Ex-Cell-O Representative today or, if you prefer, by writing direct.

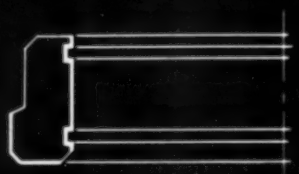


Standard Ex-Cell-O Way units can be combined in these combinations for precision boring, turning, facing, grooving and chamfering.

EX-CELL-O PRECISION PRODUCTION NEWS



Left: In this Style 312 three individually adjustable tool blocks at each station hold grooving tools, boring tool and a tool for facing, chamfering and turning operations.



Above: Machining steps are shown by heavy lines on cross-section drawing. Below: This Style 312 is also suited to the intricate contour-machining required in aircraft and missile development.

More Operations—

FASTER!

Cam Boring Machine precision faces, chamfers, turns, bores and grooves 140 steel transmission races per hour

A two-spindle Style 312 Cam Boring Machine is combining precision with high volume production of steel transmission races made by a major automobile manufacturer.

Air-operated chucks hold the parts in the spindles. Two sets of tools—four tools in each set—are mounted on the cross-slide. The first tool faces, chamfers and turns; the second bores the I.D., holding to plus-or-minus .001″ tolerance. Tools three and four plunge the two grooves, radiused to .010″. Critical dimensions are held to close limits on all machining cycles.

The precision-built Style 312 is particularly suited to the intricate contouring required by aircraft and missile components.

Your Ex-Cell-O Representative can provide full details, or write directly to Ex-Cell-O.

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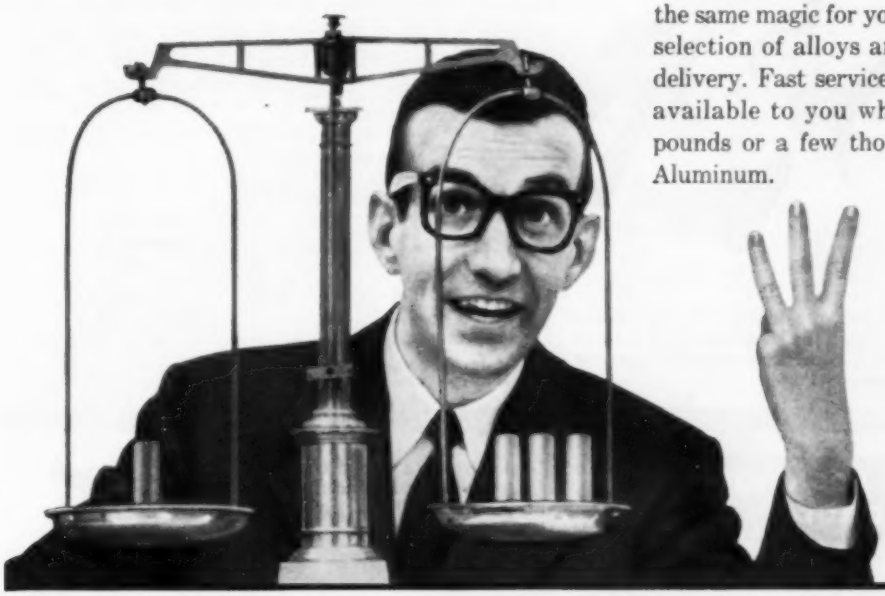

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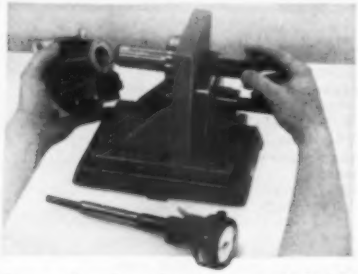
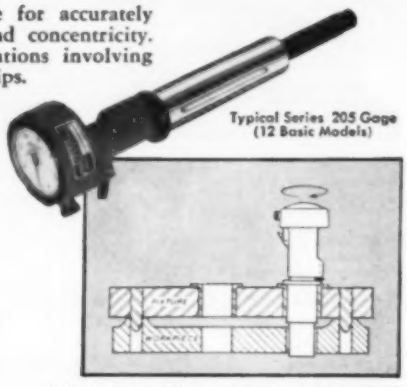
Squareness and location of holes in three mating parts of pump housing are checked to determine alignment within .0001".



Two small and one large hole are checked for parallelism with each other.



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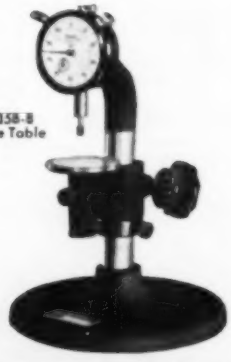

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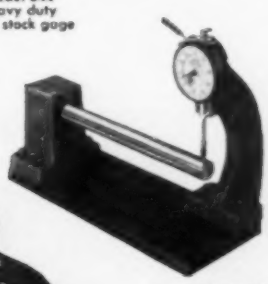

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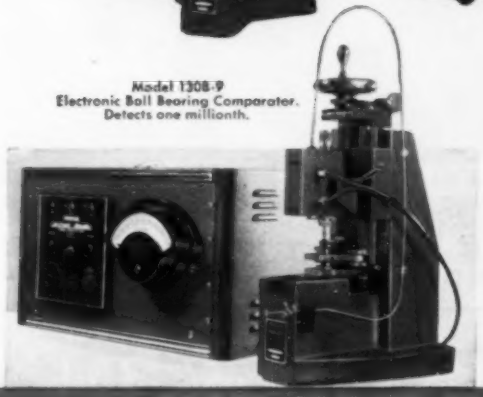

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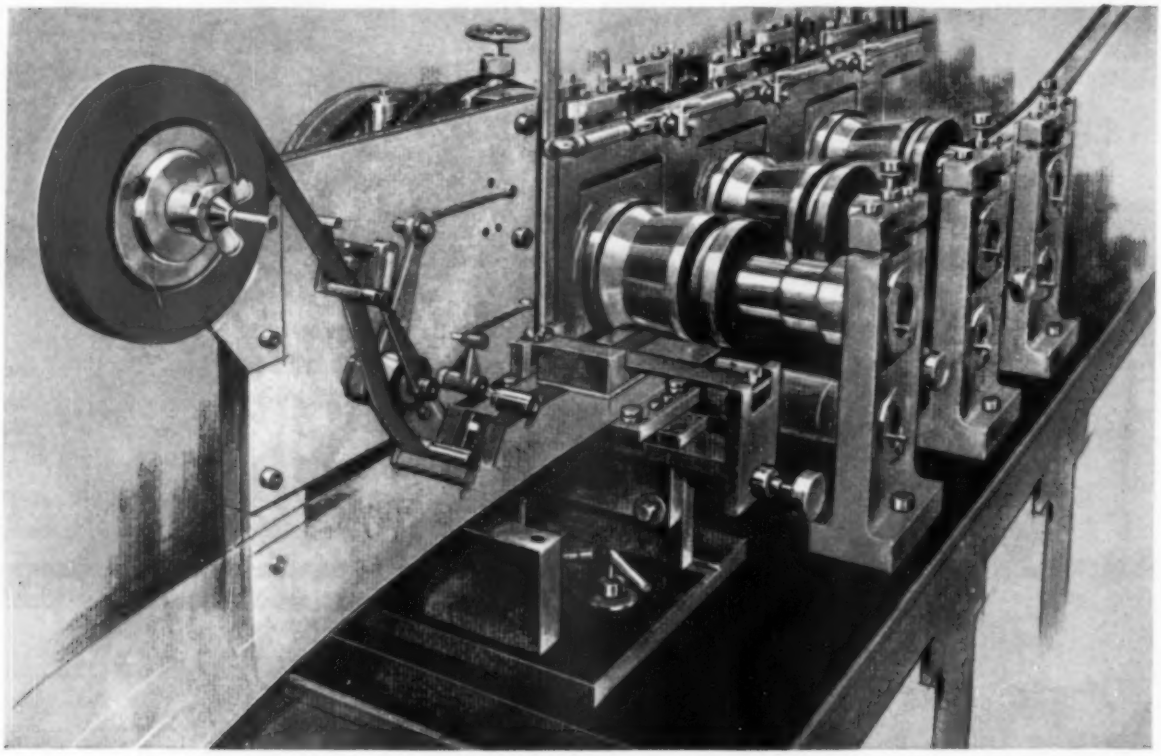

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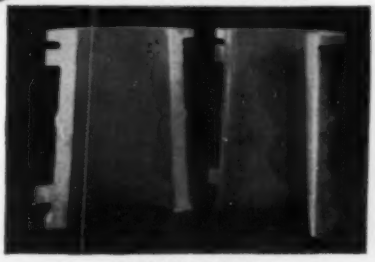

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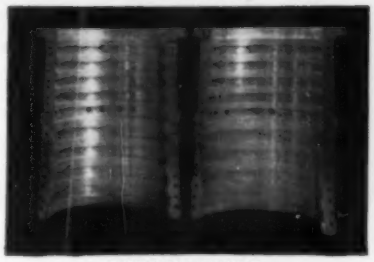

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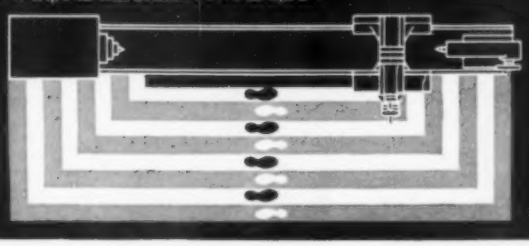

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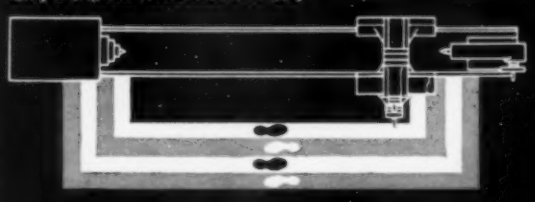

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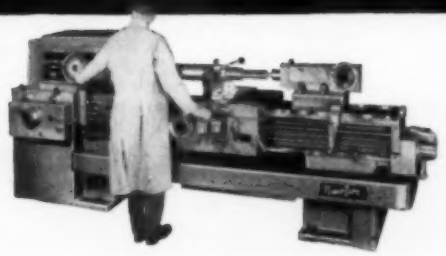

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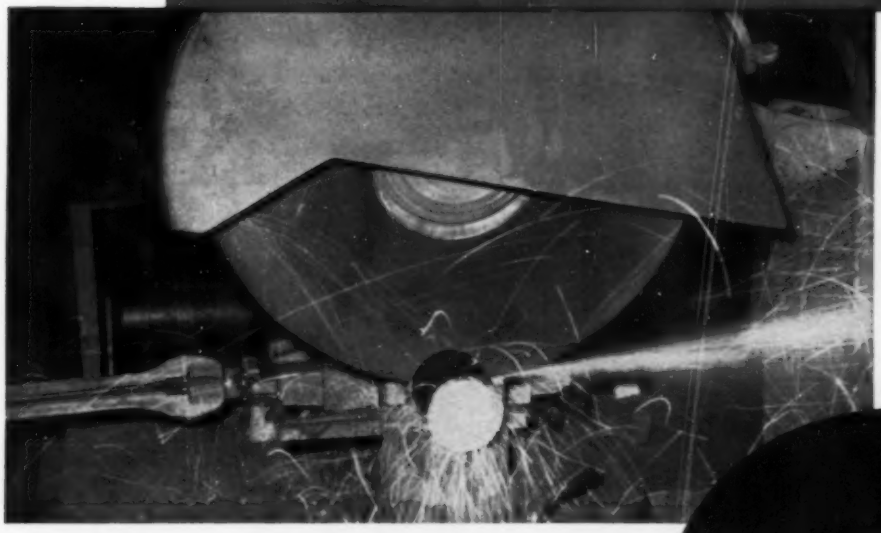

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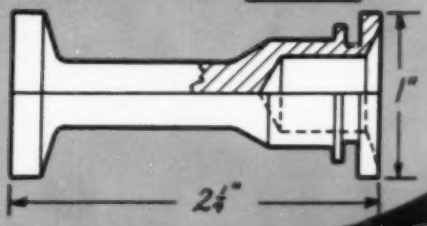
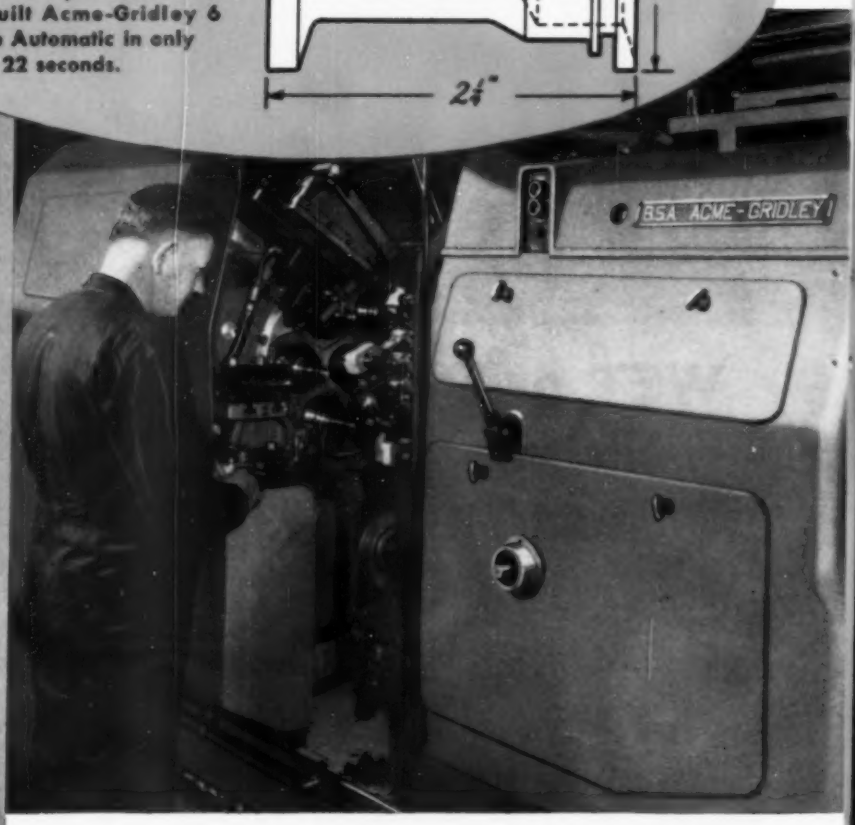
All 'round the world...

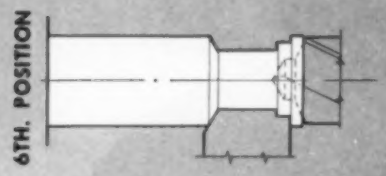
How Acme-Gridley BASIC DESIGN saves time in AUSTRALIA

This Piston Master Cylinder requires 14 operations to complete. All were performed on a British built Acme-Gridley 6 Spindle Automatic in only 22 seconds.

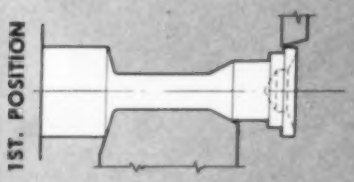




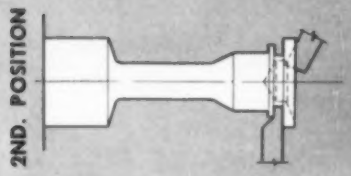
1⅝" Six Spindle Acme-Gridley Bar Automatic at work in a suburb of Sydney, Australia.



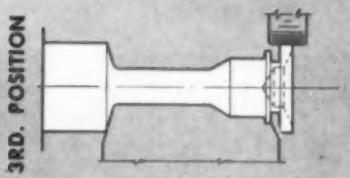
FEED OUT—FORM FRONT
HALF-DRILL PARTWAY



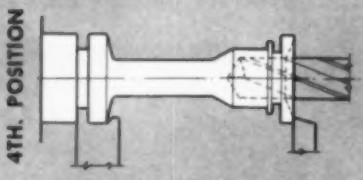
FORM BACK HALF
TURN HEAD DIAMETER



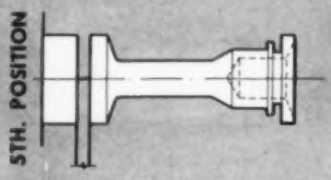
FORM GROOVE—
TURN INTERNAL CHAMFER



FINISH FORM—SUPPORT



FACE END
DRILL REMAINDER
FORM REAR AND
BREAKDOWN FOR CUT-OFF



CUT-OFF

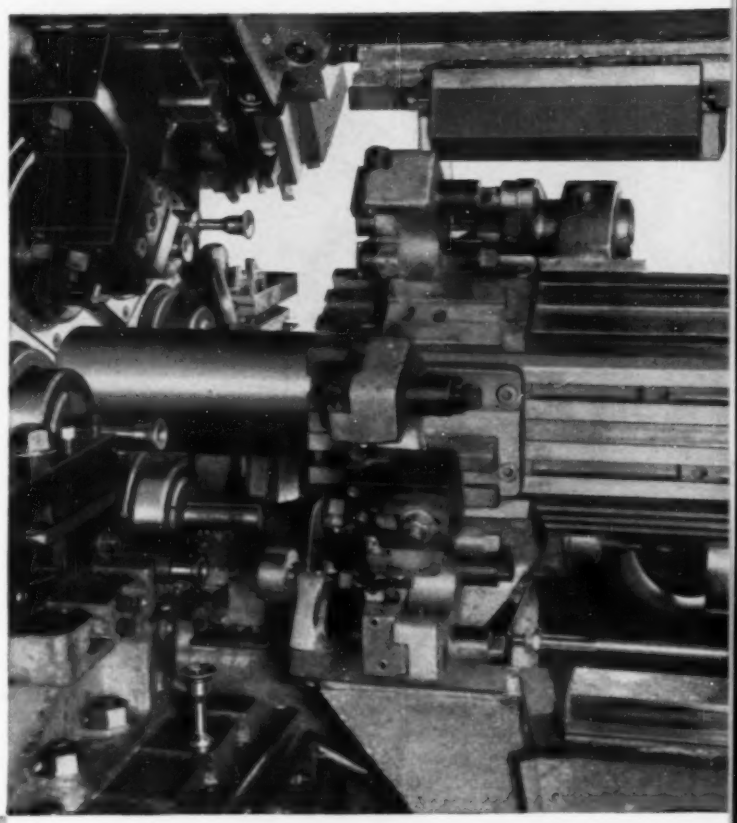
. . . where there's work to be done and time to be saved . . .

there's an Acme-Gridley to do it!*

If you were to walk down Tarrington Road in Sydney, Australia, you'd hear a busy whir that is a familiar sound in the metalworking plants of Detroit and Dusseldorf, Cleveland and Coventry. It's the sound of Acme-Gridley automatics producing metal parts at high speeds, great precision and maximum economy.

A typical example of Australian production is the piston master cylinder illustrated. This part, produced by Messrs. Duly & Hansford Pty. Ltd. of Sydney, is machined on a 6-spindle Acme-Gridley automatic from free cutting mild steel bars. The production cycle is 22 seconds—a tremendous saving in time over any other possible method.

This high speed—high quality production is typical of the way Acme-Gridley circumferential automation makes things faster—better—cheaper—all 'round the world. That's why we say "When there's work to be done and time to be saved, there's an Acme-Gridley to do it."



The wide-open tooling zone of Acme-Gridley Automatics provide extra capacities—extra versatility.

why don't you

INDEX . . . to lower machining costs . . . with *Acme-Gridley*

CIRCUMFERENTIAL AUTOMATION

National Acme

THE NATIONAL ACME CO.
171 EAST 131ST STREET
CLEVELAND 8, OHIO

Sales Offices . . . Newark, N. J. . . . Detroit, Mich. . . . Chicago, Ill.

*BUILT ONLY BY THE NATIONAL ACME COMPANY AND THEIR LICENSEES—B.S.A. TOOLS LTD., ENGLAND; AND PITTLER MASCHINENFABRIK AKTIENGESELLSCHAFT, GERMANY

DIRECT

At end of cut, operator spins speed selector handwheel to new setting. Hydraulic power shifts gears while operator indexes turrets and repositions tools for next cut. There is no waiting, no stopping of spindle, no releasing of clutch.

PRE-SET

While machining is being performed, operator sets speed selector on desired speed for next cut. When ready to change, he simply taps Hi-Lo lever to initiate shift, and is free to index and ready tools for next cut.

HI-LO

During either direct or pre-set operation, operator can reduce speed instantly in 8:1 ratio on Ram Type and 6:1 ratio on Saddle Type Turret Lathes by depressing Hi-Lo lever. Ideal when going from drilling, turning or boring to threading, forming or reaming. Raising Hi-Lo lever returns spindle to original speed.

No computing. Operator rotates knurled dial until desired surface speed shows in window. Then he aligns work diameter number with Hi-Lo lever to obtain correct spindle speed.

WHY WAIT LONGER?

Get fast, smooth, effortless speed changes with Gisholt Hydraulic Speed Selector

A turn of this handwheel can influence your profit picture.

Offering a choice of pre-set or direct operation, the Gisholt Hydraulic Speed Selector eliminates time lost waiting for gears to shift. Your operator does not stop the spindle to make speed changes—nor does he release the main drive clutch. All he has to know are his work diameters. This means he can select the right spindle speeds quickly, effortlessly, without lengthy computation.

Consider what this means to your manufacturing processes: Because it is so *easy* for your operator to change speeds, he is continually encouraged to use the most effective speed for every operation, on all diameters, for all materials. Maximum tool life and a finer finish are obtained. Secondary operations are minimized. And your operator doesn't have to work as hard.

The Hydraulic Speed Selector is typical of the many advanced features on the new Gisholt MASTERLINE Ram Type and Saddle Type Turret Lathes.

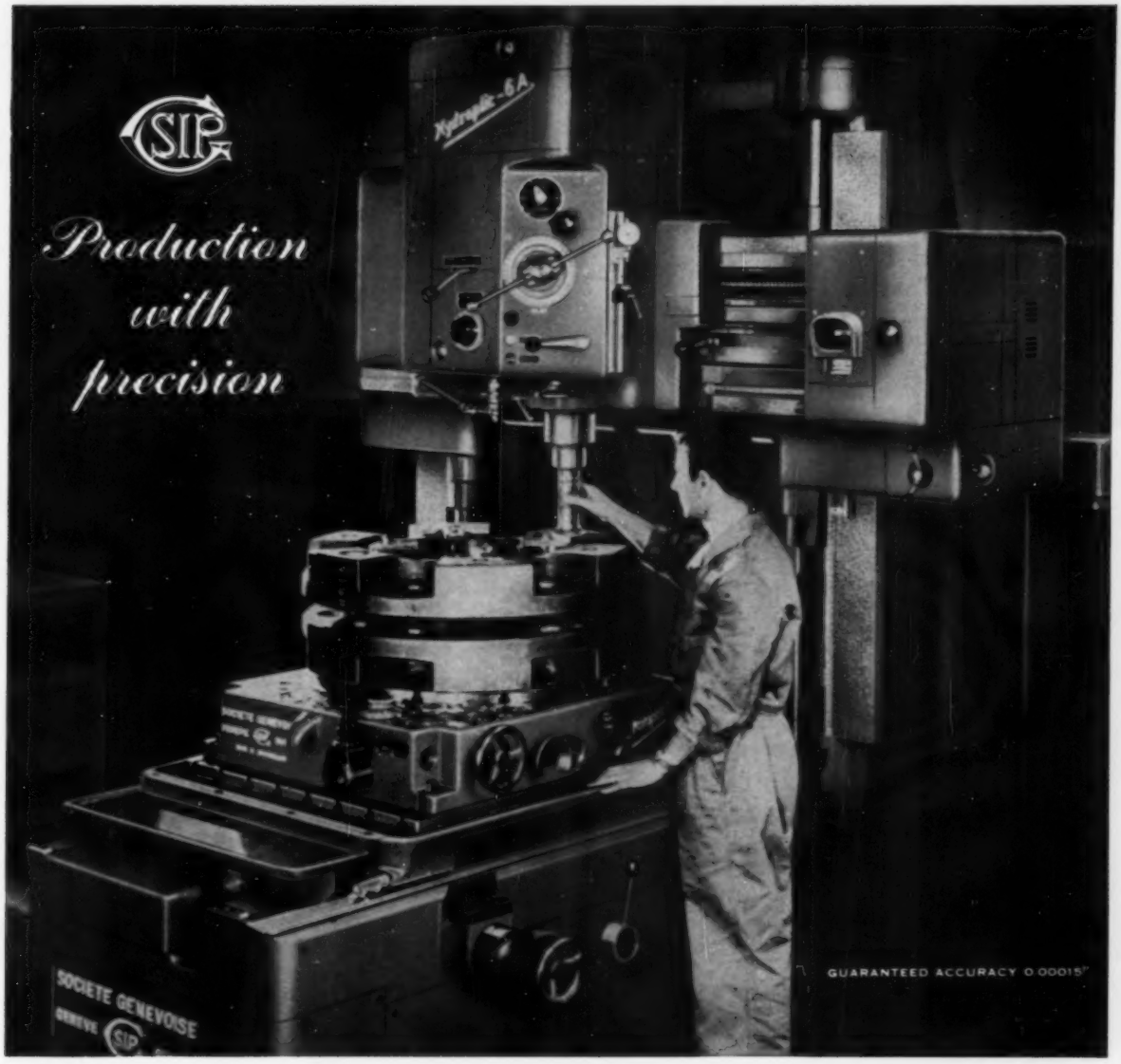
Hydraulic Speed Selector is standard feature on Gisholt MASTERLINE Ram Type Turret Lathes (up to 16 spindle speeds, up to 25 hp. single-speed driving motor) and on Gisholt MASTERLINE Saddle Type Turret Lathes (up to 24 spindle speeds, up to 75 hp. single-speed driving motor).

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW-MACHINE GUARANTEE

Send new literature on MASTERLINE Turret Lathes, Ram ☐ Saddle ☐
Please have Gisholt representative call ☐



. . . attained with the New SIP HYDROPTIC 6A Jig Boring and Milling Machine

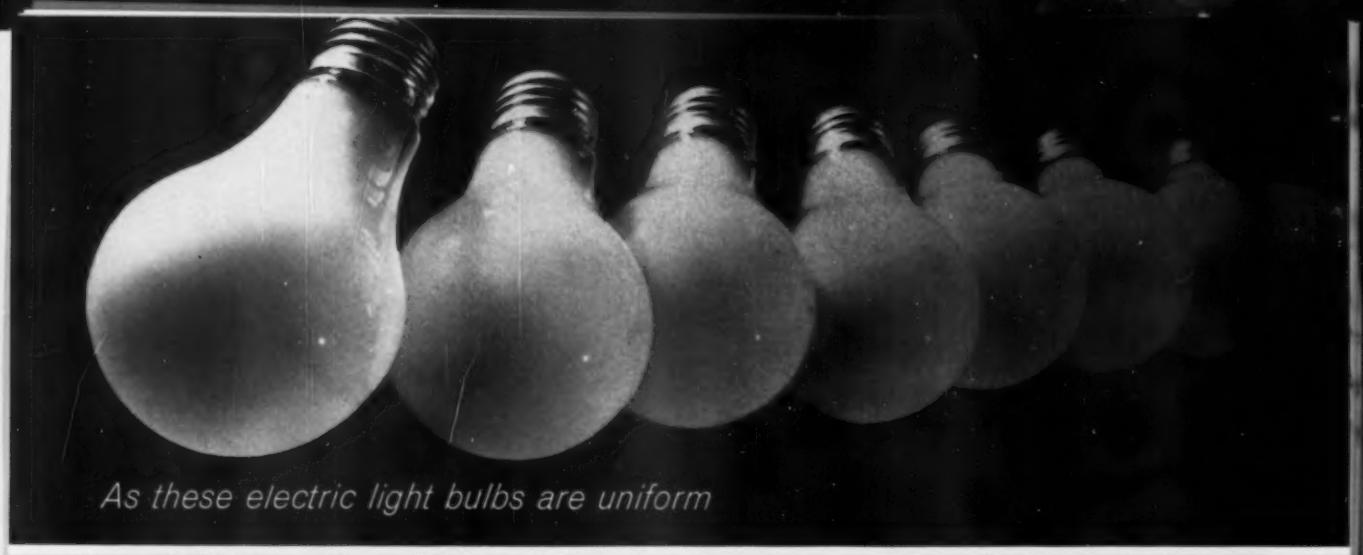
Due to unprecedented cutting ability . . . increased range and capacity . . . simplification of controls . . . and ease of operation, the HYDROPTIC 6A is unmatched in performance.

Up to **30% increase** in productivity has been realized with the AUTOMATIC COORDINATE REPEATING DEVICE DIR (optional equipment) which repeats successively the initial settings made during the machining of the first workpiece.

For complete information, send for Catalog No. 1149.

As with all SIP HYDROPTICS, *accuracy is based on* SIP *High Precision* STANDARD SCALES.

AMERICAN SIP CORPORATION • 100 EAST 42 STREET, NEW YORK 17, N.Y.



As these electric light bulbs are uniform

...So Card special purpose taps are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production is the cutting tool itself. Because Card taps are identical — and available in many different surface treatments for specialized, difficult applications — they keep production up to par — and predictable. Shopmen know about the uniformity of Card taps — and gages. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

The CARD Quality

CARD

DIVISION OF UNION TWIST DRILL COMPANY

—Serving you through the best distributors from Coast to Coast

If you use carbide tools as steadily as machine tools use coolants . . .

This brand cuts down your carbide tool usage, production time and costs!

The more you use carbide tools the more you need Union

Wherever your production calls for cutting with carbide tools, use Union carbide tools. They perform better . . . last longer . . . lower your costs per piece produced. Union also manufactures drills, milling cutters, gear cutters, end mills, reamers, hobs and inserted blade cutters. **Available nationally through Union Distributors** and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

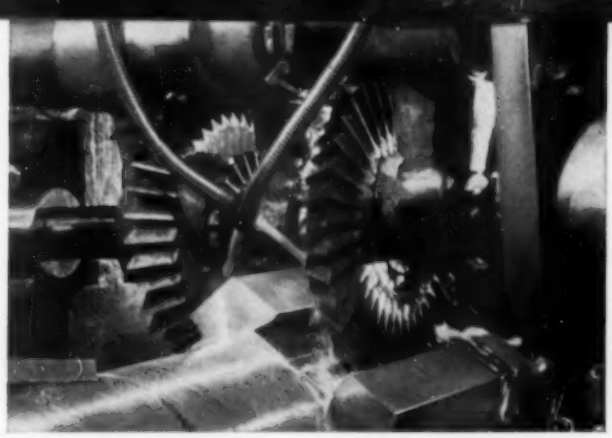
UNION

TWIST DRILL COMPANY, Athol, Massachusetts

S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

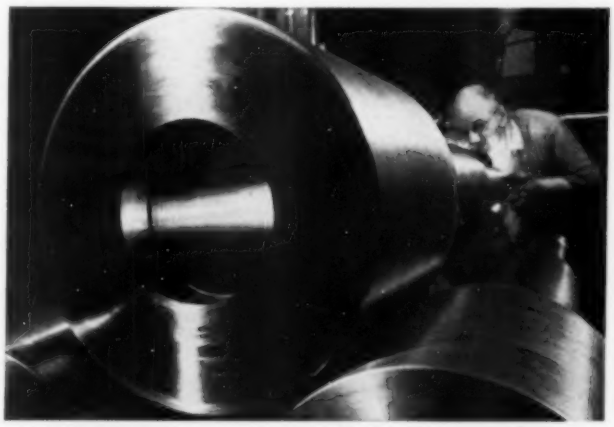
See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

SAVES $150 PER GEAR—In cutting a double-web design fabricated gear on a gear generator, tool cost formerly averaged $180 per gear. By switching to ALCO Hi-Qua-Led Steel with its lower friction component, tool wear is reduced, and manufacturer reports savings of approximately $150 per gear.



MILLING TIME DOWN 71%—Hi-Qua-Led Steel open-die forgings enabled a machine tool builder to reduce time for straddle-mill dovetailing of pentagon shape by 71%. Overall time for piece, including milling, turning and trepanning, is cut 33%, and a significant saving in tools is also noted.

IMPROVED FINISH—A manufacturer reports a much smoother gear finish with ALCO Hi-Qua-Led Steel. There is a complete lack of burrs which formerly required extensive hand filing to remove. In addition, time for this cutting operation on a Fellows gear shaper is reduced 47%, and tool wear is down 20%.

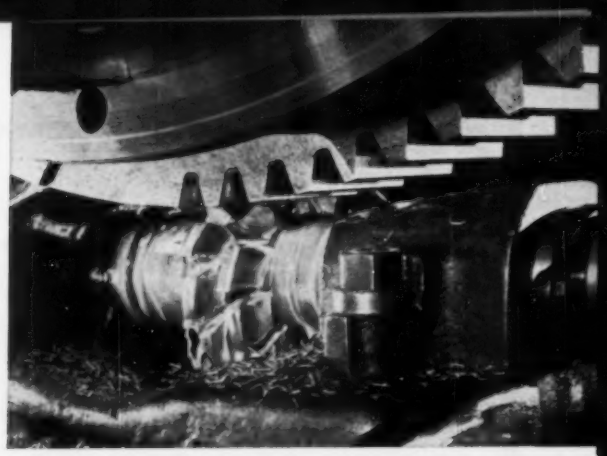


700% INCREASE IN TOOL LIFE—In trepanning a 4 in. diameter hole 42½ in. long with a Warner & Swasey lathe, tool life averaged one piece per tool. With Hi-Qua-Led, 8 pieces are now obtained with the same tool. Manufacturer reports that Hi-Qua-Led Steel also provides much better chip formation.

EASY-MACHINING HI-QUA-LED STEEL* FORGINGS GIVE INDUSTRY NEW OPPORTUNITY FOR PROFIT

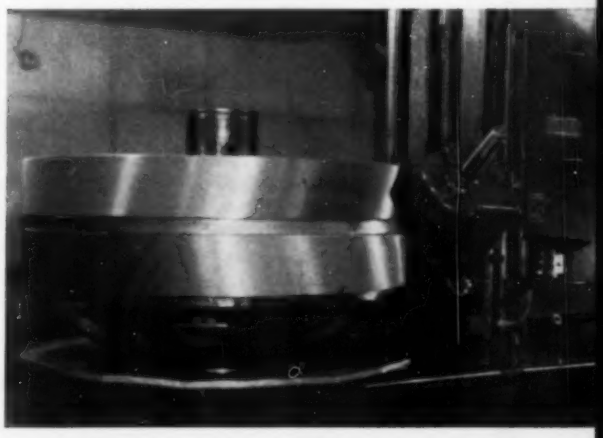
* **HI-QUA-LED STEEL**—ALCO's registered trademark for its new process leaded-steel forgings that are making outstanding reductions in tool wear, machining time and production costs.

TOOL DOES 3 TIMES THE WORK—With Hi-Qua-Led Steel, a King boring mill operation that once required 3.4 hours is off the machine in 43 minutes. Through the lower frictional properties of Hi-Qua-Led Steel, the manufacturer obtains 10 pieces per tool grind as compared to 3 pieces obtainable with non-leaded steel.



8-HOUR JOB DONE IN 3—Another manufacturer reports that roughing and finishing a gear required a total of 8 hours and 8 minutes on his gear cutter. With freer-machining Hi-Qua-Led Steel and the increased speeds and feeds it permits, the job is now completed in just 3 hours and 10 minutes.

FASTER SPEEDS, NORMAL TOOL WEAR—A gear manufacturer using a Fellows gear cutter was able to increase rough-cut speed 37% and finish-cut speed 111% with Hi-Qua-Led Steel. Smoother operation is noted, and the tremendous reduction in machine time is accomplished with only normal wear to cutter.



SAVES FULL WORK WEEK—Using gear blanks of ordinary steel, roughing and finishing on a Gould and Eberhardt machine previously required 65.1 hours. The improved machining qualities of Hi-Qua-Led Steel have speeded up gear production and the job is now completed in 24.9 hours, saving a 40-hour work week.

The easy machinability of ALCO's Hi-Qua-Led Steel® forgings is setting new production records and boosting profit throughout industry. While maintaining all the physical characteristics of regular steel in any AISI grade, forgings of Hi-Qua-Led Steel, ALCO's special process leaded steel, provide the extra benefits of greatly reduced machine time, longer tool life and improved surface finish. In addition, the reduced friction component of Hi-Qua-Led Steel forgings assures much closer tolerances.

By switching to ALCO's Hi-Qua-Led Steel forgings in your operation, you can cut your machining costs drastically. Along with this reduction in costs, Hi-Qua-Led Steel forgings will provide the same service in your end product as you obtain with regular forgings.

ALCO specialists are available to show you—on your own machines, in your own plant—how Hi-Qua-Led Steel forgings will boost your profit. Forgings are available in seamless rolled circular shapes from 18 to 145 in. OD, in open-die shapes from 1,000 to 30,000 lb and 40 ft long, and in mandrelled seamless circular shapes up to 60 in. wide. Contact the ALCO sales office nearest you for complete details. For a booklet containing technical information on Hi-Qua-Led Steel forgings, write ALCO Products, Inc., Dept. 153, Schenectady 5, New York.

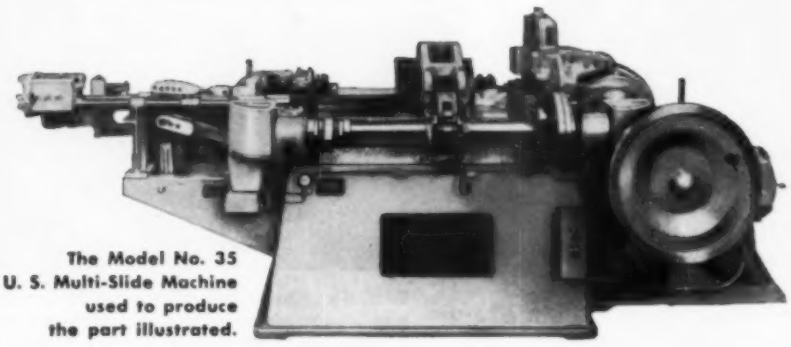
ALCO

ALCO PRODUCTS, INC.

NEW YORK

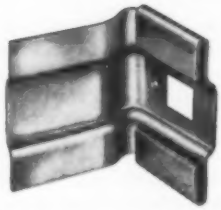
SALES OFFICES IN PRINCIPAL CITIES

LOCOMOTIVES · DIESEL ENGINES · NUCLEAR REACTORS · SPRINGS · STEEL PIPE · FORGINGS · OIL-FIELD EQUIPMENT



The Model No. 35
U. S. Multi-Slide Machine
used to produce
the part illustrated.

U.S. MULTI-SLIDE® MACHINES ELIMINATE SECONDARY OPERATIONS



The cost saving potential of U. S. Multi-Slide Machines is, once more, demonstrated here in the economical production of a stamped automotive part.

By using the No. 35 U. S. Multi-Slide, the Production Metal Stamping Company of Toledo, Ohio is able to completely eliminate all secondary operations and handlings in the production of the formed stamping illustrated.

The No. 35 U. S. Multi-Slide produces this part in one operation. Cold rolled steel .059" thick by 3.210" wide is fed into the machine from coils and finished parts are produced at the rate of 85 per minute.

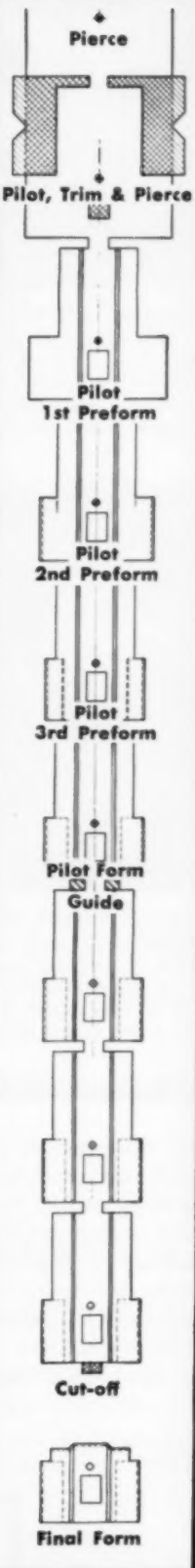
Each of the four models of U. S. Multi-Slide Machines is designed for the economical production of stampings. They are adaptable to the manufacture of wire parts as well as stampings from flat coil stock. In some instances more than one strip can be fed into a U. S. Multi-Slide for processing and completing an assembly. Prefabricated parts can be hoppered, positioned and assembled to the stampings being made while still in the machine. It is because of this versatility that the use of U. S. Multi-Slide Machines can considerably lower your component costs.

For the uniform, economical production of stampings — write for your copy of the U. S. Multi-Slide Bulletin No. 15-A — or send us your part drawings or samples for our recommendation.

MULTI-SLIDE

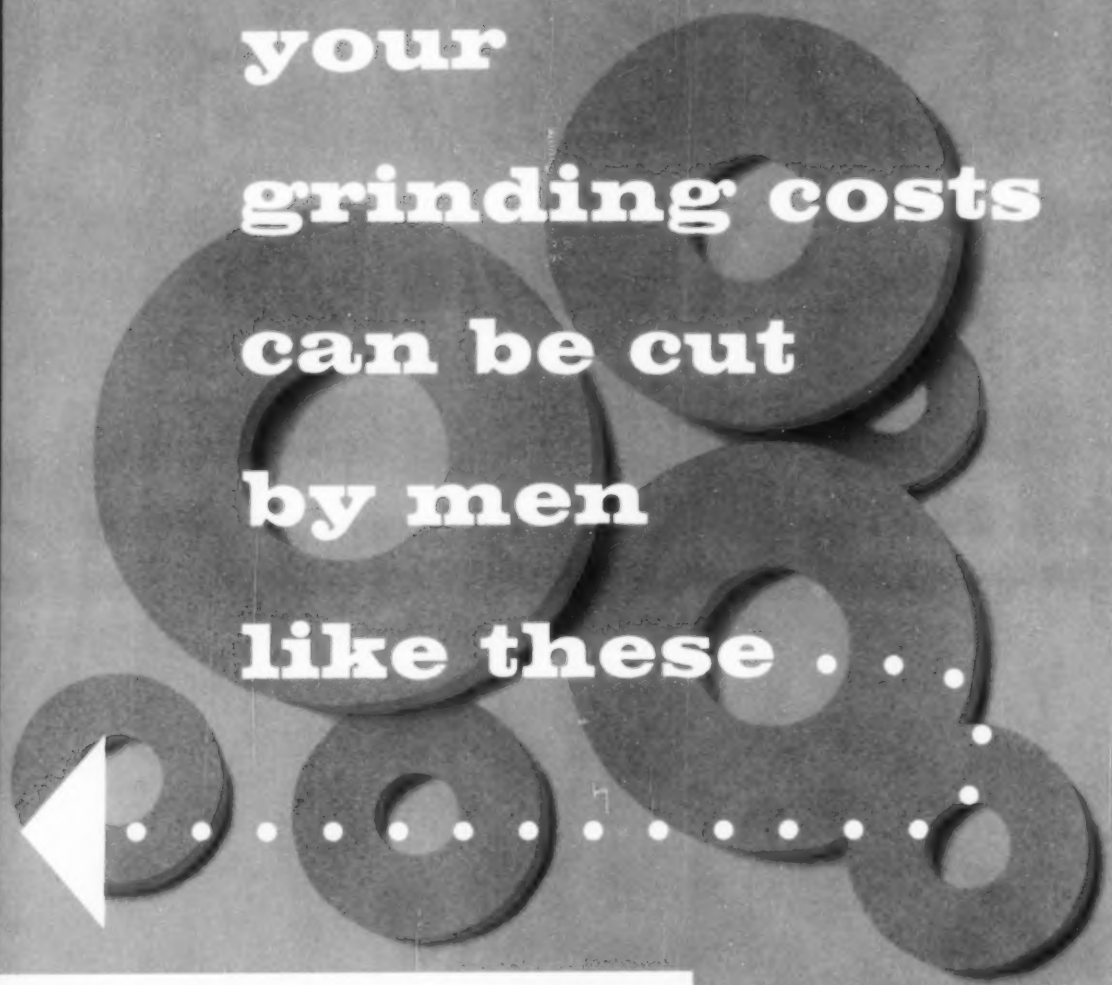
U. S. TOOL COMPANY, INC. AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories



10 to 1

your grinding costs can be cut by men like these . . .



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—POSTAGE WILL BE PAID BY—

MR. ELDEN L. AUKER, Vice-President
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO,
MASSACHUSETTS

Why not let a Bay State abrasive engineer study your grinding problems? Just fill out and mail this card and he will call.

Elden L. Auker,
Vice-President

"We want your toughest grinding problems..."

ESTABLISHED 1922
BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS COMPANY

WESTBORO, MASSACHUSETTS, U.S.A.
TELEPHONE WESTBORO FOREST 8-4433

Some people don't like to be called eager beavers.

We do. In fact, we're proud of it.

It's one reason why we devote so much time, effort and money to research and development . . . why our company has grown so fast and why we have been able to expand, modernize and remodernize our plants year after year.

It's also one reason why our field representatives are not only experienced and hard-working salesmen . . . but also genuine experts on grinding problems. They know their grinding wheels, of course . . . but they also know when to look beyond the wheel to solve the basic grinding problem.

That's why we feature our distributors and our company representatives in our advertising. We believe that the quality of Bay State products added to the knowledge and experience of men like those shown on the preceding pages make a combination that's rarely equalled, never surpassed.

How about letting us prove it?

Just fill in the enclosed card and mail it to me. We'll show you mighty quick what happens when you combine the best abrasive wheels on the market with real abrasive engineering service. No obligation, of course.

Sincerely,

Elden L. Auker

Elden L. Auker
Vice-President

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVES

Jack O'Sullivan's new grinding technique cuts costs and back-aches – (Bay State distributor Jack O'Sullivan of Engineered Sales Co., Summit, N. J.)

Jim Frederick proved that 1 wheel could out-perform 3 at Steelcraft Tool Co. – (Bay State distributor Jim Frederick of Industrial Abrasives Co., Detroit)

Bet
grind
at lo
cos

Vic Ericson helped make 1 wheel do the work of 12 at Whitin Machine Works. (Bay State distributor Vic Ericson of Johnson deVou, Inc., Worcester, Mass.)

Earl Singleton cut the costs of grinding heavy traction gears – (Bay State distributor Earl Singleton of Browning Tool & Supply Co., Indianapolis)

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BAY STATE
WHEELS of PROGRESS

BAY ST
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Don Kennedy cut snagging costs at a large East Coast shipyard. (Bay State abrasive engineer Don Kennedy)

Jim Lewis put one wheel to work on *two* machines! (Bay State distributor Jim Lewis of Lewis Sales Co., Cleveland)

Bun Walker is an expert's expert on roll grinding. (Bay State abrasive engineer Bun Walker)

John Martin beat his own best cut-off wheel by 50% – (Bay State distributor John F. Martin of Mau-Sherwood Supply Co., Cleveland)

The Bay State men shown on these two pages are typical representatives of a field organization that has built up a unique reputation for working out cost-cutting solutions to grinding problems.

Like these men, your own Bay State representative is a thoroughly trained abrasive specialist who puts service before salesmanship. Why not fill out the card at right and see for yourself?

TATE
SIVES

Mr. Elden L. Auker, Vice-President
Bay State Abrasive Products Co.
Westboro, Massachusetts

Dear Mr. Auker:

I would like to have one of your abrasive engineers call on me. I understand there is no obligation.

Name_____

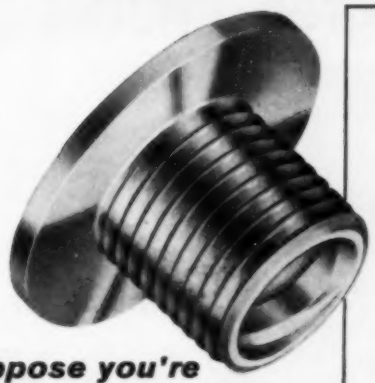
Title_____

Company Name_____

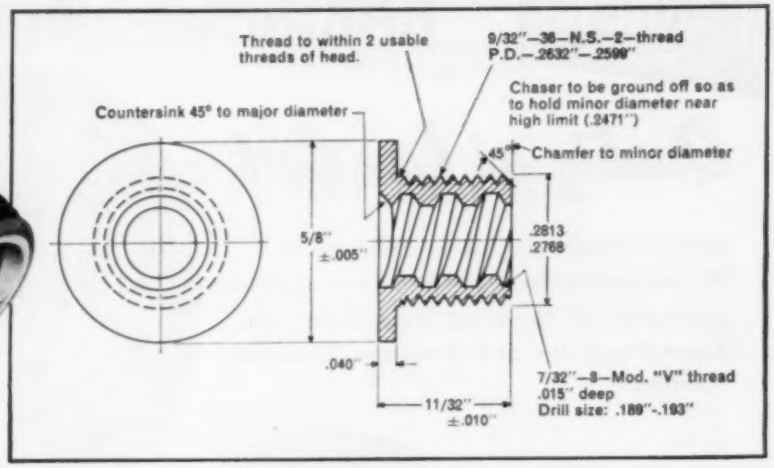
Address_____

City_____ State_____

BETTER MACHINING STARTS WITH ALCOA SCREW MACHINE STOCK



Suppose you're handed this part to turn out...



Alcoa Aluminum will give up to 4 times higher cut-off feed

Operations in this flange bushing layout include internal and external threading with an extremely thin wall at the root of the threads. It's not an easy part to make.

But notice the high feeds with Alcoa® Aluminum Screw Machine Stock (2011-T3). Cut-off feed is .0042/rev—up to 4 times higher than with other materials. And the surface speeds: tap is 56.5 fpm; threading tool is 73 fpm; stock is 634 fpm.

So much for speed. What about quality? Alcoa Aluminum retains the surface finishes produced by machining—cut-off finish is superior. You can polish, buff, brush or burnish aluminum—and parts don't deteriorate in storage.

Convenience? Aluminum's light weight means easier handling, faster stock-up time. Because aluminum doesn't punish your tools, there's less downtime for maintenance. Aluminum means less heat—you can use lighter oils. Alcoa 2011-T3 gives top spindle speeds and fewer chip problems. Result: Lower Costs.

Find out more about better machining with Alcoa Aluminum Screw Machine Stock. Here's how to do it:

- Meet Tom Conroy, Alcoa's Screw Machine Specialist and field consultant. He will be glad to demonstrate aluminum's advantages. See coupon.
- Send for free book, *Alcoa Aluminum in Automatic Screw Machines*. It's a valuable procedures manual written for production men.
- Ask for immediate stock delivery by calling your nearest Alcoa sales office or Alcoa distributor.

MULTIPLE SPINDLE LAYOUT

PC. NO. V5-1248	**TIME PER PC.** 1495/hr.	**DATE** 4-8-58
MACHINE 1" N.B.—Mod. 60	**MATERIAL SIZE** 5/8" Rd.	**MATERIAL GRADE** 2011-T3
SPINDLE R.P.M. 3875	**CHUCKS** 5/8" Rd.	**FINGERS** 5/8" Rd.
SPINDLE GEARS 89-31	**FEED GEARS** 71-49	
KIND OF THREADING SPINDLE N.B.	**RATIO** .255 **ON** .498 **OFF**	
THREADING 990 **REV.**	**TOTAL USABLE REV./PC.** 74.3	
SURFACE SPEED 634 Stock 73 Die 56.5 Tap **FT. PER MIN.**	**MIN. INDEX TIME** 1.18 **SEC.**	

SEQUENCE OF OPERATIONS

OPERATION	RISE	LEV.	FEED	CAM NO.	TOOL	HOLDERS
1—Box .281" Dia.	.625		.0084	5/8	Pick-up Std.	# 22 B.&S. Box Tool
Center					Pick-up Std.	in above Tool
2—Drill .193" Dia.			.0084	5/8	4.9 mm Drill	# 14 B.&S. Floating
3—Recess			.0021	5/8	V5-1248	N.B. Recess Tool
4—Thread				V5-1248	9/32-36 NS-2 Chasers	# 101 H.&G. Die Head
5—Chamfer			.0084	5/8	Pick-up Std.	# 22D B.&S. Center & Face
6—Tap				V5-1248	7/32-8 Mod. "V" Tap	# 22F B.&S. Releasing Tap
Cut-off	.3125		.0042	5/16	1/4 Str. Blade Ground to .187"	N.B. Inside

REMARKS: 1/4" c/o Blade Ground to Break Down for Box Tool.

Look for this label . . . it's your guide to the best in aluminum value.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

Aluminum Company of America
868-F Alcoa Building, Pittsburgh 19, Pa.

Yes, I'd like to—

☐ Hear from Tom Conroy.

☐ Have a copy of *Alcoa Aluminum in Automatic Screw Machines.*

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

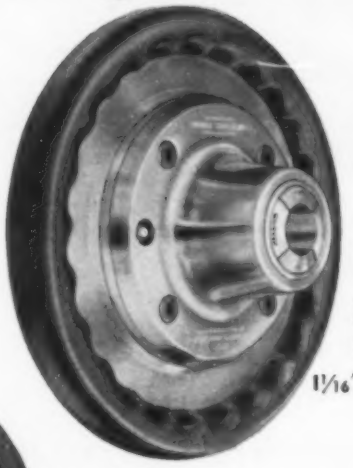
HARDINGE
ELMIRA, N.Y.

HARDINGE Sjogren Chucks

Quality at Low Cost

HARDINGE-SJOGREN Speed Collet Chucks for tool room lathes, engine lathes and grinders.

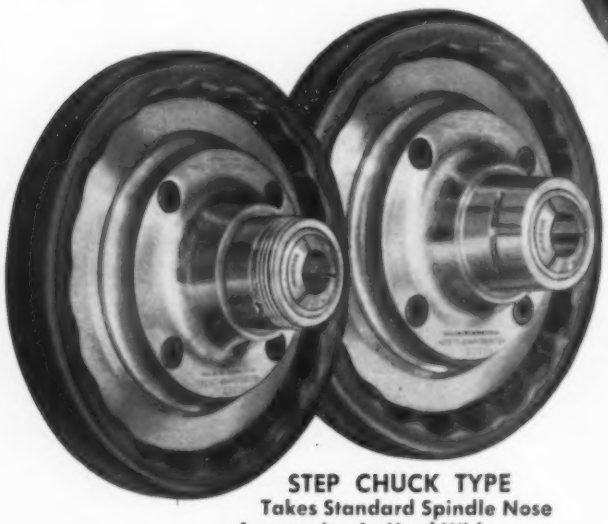
Available for Threaded Nose, Cam Lock, Taper Key Drive and American Standard Spindles.



REGULAR TYPE

AVAILABLE IN FIVE COLLET CAPACITY SIZES

1 1/16", 1 3/8", 1 3/4", 2 1/4", 3 1/2"



STEP CHUCK TYPE
Takes Standard Spindle Nose Accessories As Used With Hardinge Precision Machines

LEVER TYPE

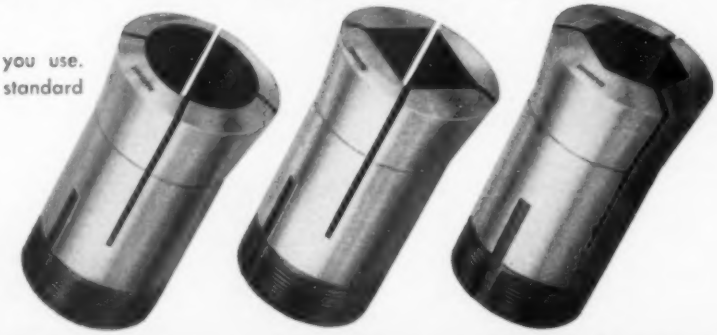
Ask Your Hardinge Representative or Local Distributor For Bulletin 88

HARDINGE
ELMIRA, N.Y.

HARDINGE Low Cost Steel Collets

Maximum efficiency — Pay for only what you use. Records show that 82% of all sizes used are standard 16th sizes.

Buy only the sizes you use — Hardinge Collet stocks are available in Atlanta, Boston, Hartford, New York, Philadelphia, Rochester, Dayton, Detroit, Chicago, St. Louis, Minneapolis and Los Angeles. Also, Toronto and Montreal, Canada.



HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

THE ARROW PROFILER

Check performance, specs and price before you buy

Performance. High feed, high speed, high horsepower—guts! For close tolerance, high production machining of aluminum, titanium or steel, be sure to see the new Arrow Profiler. Capable of any 360° profiling, 3-dimensional contouring, swarf or twist milling, the Arrow Profiler is easy to operate, accurate and versatile.

Specifications, Arrow Profiler

Table size.....42″ x 144″
Table travel.....136″
Cross travel of spindle.....48″
Feed rates.....0″–75″/min.
Table rapid travel.....150″/min.
Maximum clearance under spindle.....34″
Vertical travel of spindle on 3-D.....12″
True-Trace 3-dimensional valve.
Complete hydraulic power unit including two 100-gallon tanks, 50 hp motor, two double-end 16 gpm pumps, filters, controls and cooler.
Automatic way lubrication.
½ hp cross arm elevator motor.
Neoprene table way covers.
Complete electric wiring, 220V, 440V or 550V.
110V pendant control.

Arrow Hydraulic Spindle (Constant 40 hp)

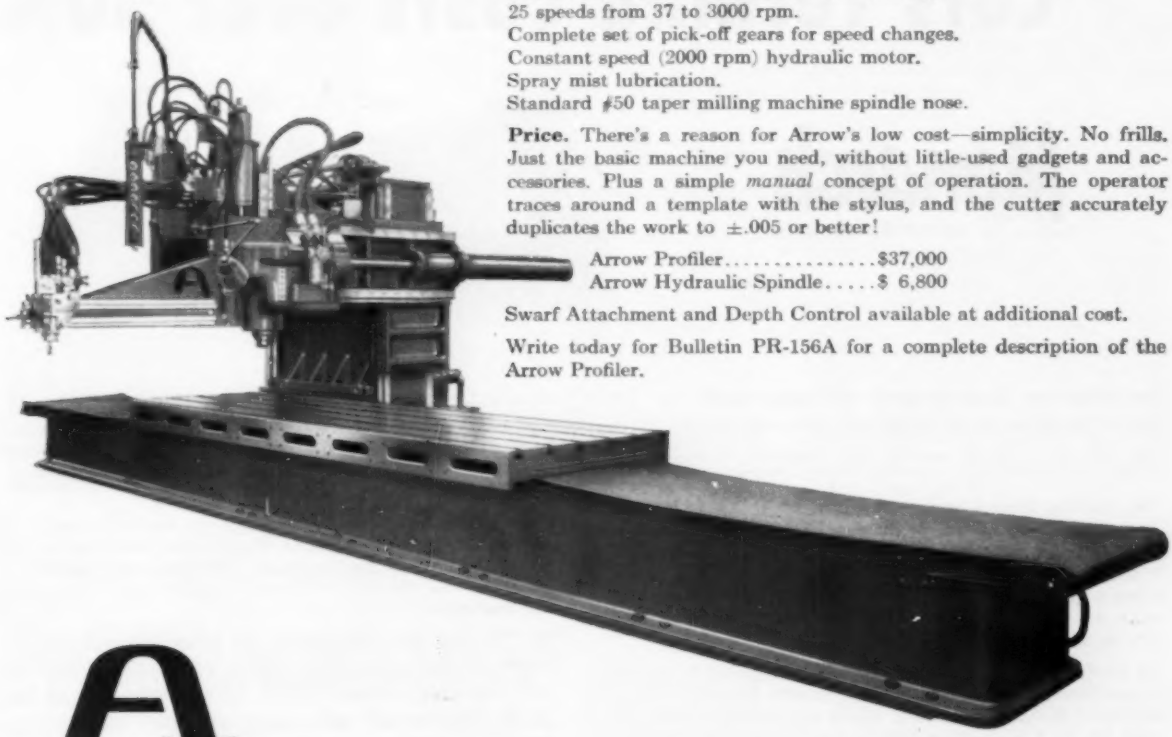
25 speeds from 37 to 3000 rpm.
Complete set of pick-off gears for speed changes.
Constant speed (2000 rpm) hydraulic motor.
Spray mist lubrication.
Standard #50 taper milling machine spindle nose.

Price. There's a reason for Arrow's low cost—simplicity. No frills. Just the basic machine you need, without little-used gadgets and accessories. Plus a simple *manual* concept of operation. The operator traces around a template with the stylus, and the cutter accurately duplicates the work to ±.005 or better!

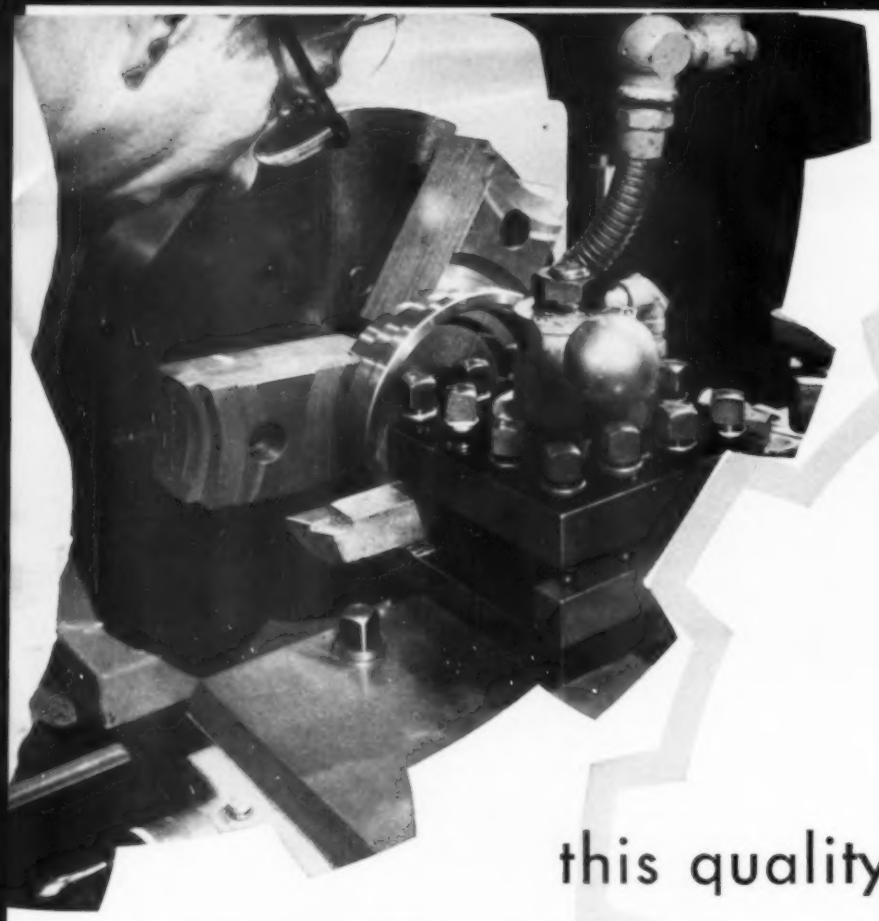
Arrow Profiler.....$37,000
Arrow Hydraulic Spindle.....$ 6,800

Swarf Attachment and Depth Control available at additional cost.

Write today for Bulletin PR-156A for a complete description of the Arrow Profiler.



ARROW ENGINEERING COMPANY, INC. *Walsingham Road, Largo, Florida*



By investing dollars wisely . . .

and meshing Monarch Air-Gage Tracer Dyna-Shift Lathes into the production line . . .

this quality gear maker

Cuts Turning Costs over 50%

. . . and you will too

Monarch TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Let Western Gear people tell you how their investment is paying off—quickly!

(The following statements were all made voluntarily by shop men of Western Gear Corporation's Lynwood Works, Lynwood, California.)

A. "We combine know-how with the finest equipment to machine 'impossible' tolerances in production line quantities. Standard machinery just will not do the job.

"On one job the metal involved was nitrolloy and our standard lathes required 30 minutes. With the MONARCH Dyna-Shift lathe, we produce the same part in only 6 minutes, an 80% reduction of production time."

B. "In another instance, our standard machine required 75 minutes to machine one part, as compared to only 40 minutes on a MONARCH lathe. Production rejects on standard lathes averaged 7% to 8% on these parts (turned from 4140 steel) . . . but we've almost eliminated rejects on the MONARCH lathes, saving as much as 50% on material costs on some parts."

C. "The manufacture of gears to total composite errors of .0005", and tooth-to-tooth errors of .0002", is an everyday occurrence here. MONARCH lathes have enabled us to maintain these tolerances virtually eliminating rejects and reducing production time per unit by a drastic margin."

D. "The MONARCH tracer is a production machine capable of turning out different diameter sizes in lots from 100 to 500 pieces and up from the template . . . yet it does the job without variation, and the only detectable changes occur because of the tool wear."

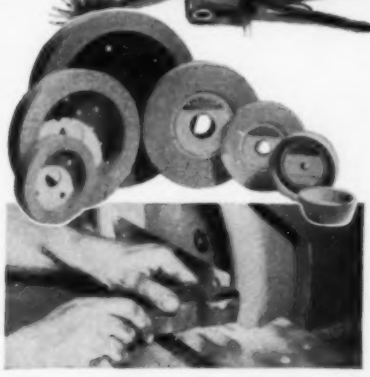
Isn't it time you investigated the greatest combination in lathes to date—the MONARCH Preselector Dyna-Shift with Air-Gage Tracer? Write for our new booklet No. 2609. It's loaded with many examples of Air-Gage Tracer savings.

The Monarch Machine Tool Company, Sidney, Ohio

Fishing for carbide grinding economies?

Catch 'em all fast— with the finest lures made

You cut grinding costs to rock bottom with Norton's outstanding wheel selection and service.



Norton K† Bond CRYSTOLON* WHEELS Bring Big Advantages to Offhand Grinding

Here's a combination of vitrified bond and silicon carbide abrasive that delivers remarkable results — particularly in offhand sharpening of single-point carbide tools. Wheels are made in dense, medium, or porous structure — for most efficient action regardless of the area of contact.

Also, CRYSTOLON abrasive is available in green or gray types — green, 39C, being first choice in a majority of carbide applications. And the Norton K Bond is one of the most radically improved vitrified bonds ever developed. One big advantage is: *it assures closest possible duplication of wheel specifications.* Which means that every time you reorder K Bond wheels you get exactly the same top performance.

Norton Diamond Wheels, Mined or Man-Made . . . Carbide Grinding's Certified Crown Jewels

Norton was first to introduce all three bond types of diamond wheels: resinoid, vitrified and metal . . . does all its own checking and sizing of diamonds . . . duplicates wheel specifications with constant accuracy.

The three Norton bonds — resinoid, vitrified and metal — cover the complete range of carbide grinding requirements — from roughing to precision — including sharpening, surfacing and cutting off — on all kinds of work: single-point tools, multi-tooth cutters, form tools, dies, blanks, etc. Resinoid wheels are available in special bond types — B for wet and B6 for dry grinding.

Norton leadership in diamond wheel manufacture continues whether the diamonds used are natural or man-made. And with each Norton diamond wheel you get a certificate of diamond concentration, bearing the signature of the President of this Company.

W-1845

The Complete Line, Completely Serviced

See your Norton Abrasive Engineer or Distributor for expert advice and prompt deliveries on the wheels you need for top quality, lowest cost carbide grinding. Or write to NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries †Patent applied for

NORTON ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

NEW! Carlton 3AR rigid

Now you can enjoy the advantage of automation as applied to heavy duty production hole drilling and boring . . . with the new Carlton 3AR, the first double box column vertical drilling machine produced for use with automatic positioning (or spacing) tables.

The new Carlton **3AR** introduces jigless heavy duty drilling and boring on a production basis.

With the Carlton 3AR and any one of the many fine types of tape or hydraulic controlled positioning tables on the market today, you can now

- Increase hole drilling production *automatically*. Work is positioned under the drill automatically, and therefore, *faster* No delays from human inertia.
- Get precision drilling, boring and spacing. Automatic positioning tables assure precise hole spacing; rigidity of Carlton's double box column construction assures hole drilling precision. No mistakes, ever.

In short, the new Carlton 3AR is made just for you and every manufacturer who needs precision, heavy duty, flexible production drilling and boring. Wire or phone us today for price and delivery estimates.
The Carlton Machine Tool Co., Cincinnati 25, Ohio

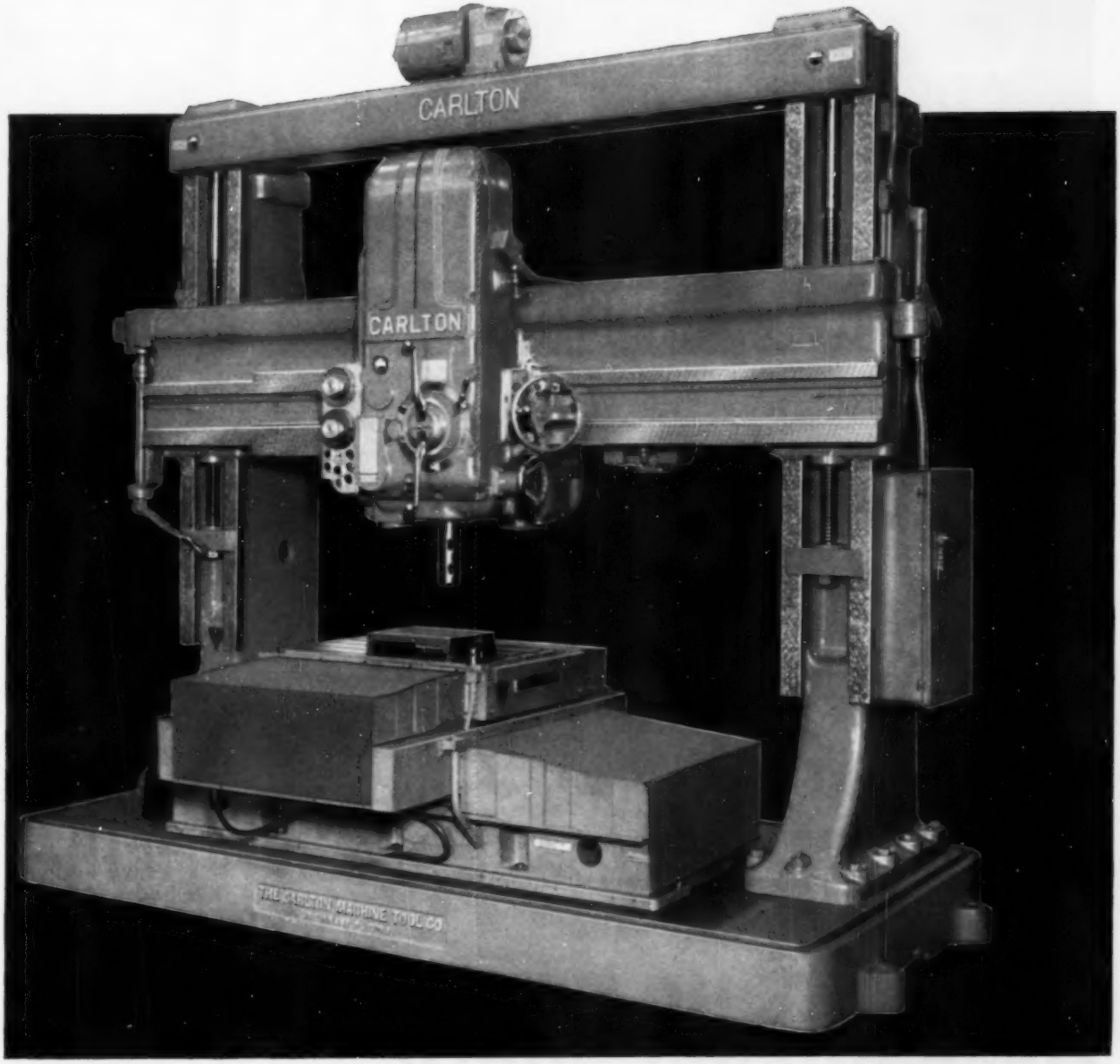
- Twin screw elevating for the rail.
- Headstock movable to facilitate loading and unloading of positioning table.
- Choice of pre-select or manual shift spindle speed control.
- Hand feed wheel equipped with micrometer adjustment dial for precision depth boring.
- As simple and easy to operate as a Carlton radial drill.

specifications

Vertical travel—rail on box posts	27"
Vertical travel—spindle in head	18"
Distance, floor to spindle (min.)	30"
Distance, floor to spindle (max.)	75"
Horizontal travel of head on rail	28"
Spindle speeds, number	36
Spindle speeds, range rpm.	100 to 1
Feeds, number	18
Feeds, range	.004"–.125"
Motor, recommended, hp.	25-30

for the most modern in hole drilling machine tools . . . see

vertical drilling machine

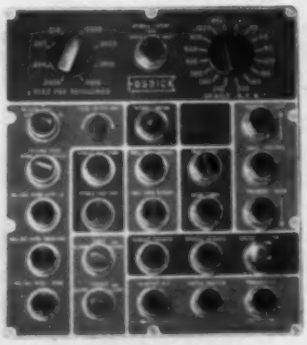


Carlton *specialists in drilling*

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U.S.A.

MEASURE

Dial dimension direct from print. There are two sets of direct-reading drum dials, one for longitudinal, the other for transverse position. Operator simply sets dials so that numbers on dials correspond with numbers on blueprint. Simple. Direct. Precise.



POSITION

Press two buttons, one for longitudinal, one for transverse positioning. Table, and work, are automatically positioned, and clamped under the tool, accurate to ± .0001"! Accuracy is dependent upon highest-quality gages, not upon screw threads. Sensitive .0001 Dial Indicators maintain a positive check at all times.

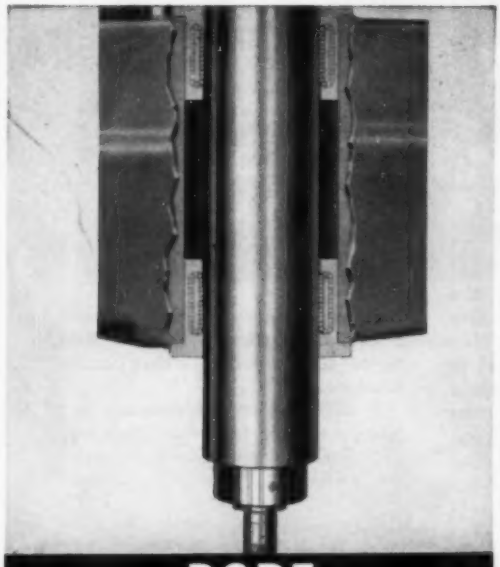
CHANGE TOOLS

Tool changing takes less than 10 seconds, with BF spindle. Can be accomplished while table is positioning. Hole sizes are repeated within ± .0001", without resetting tools! High-precision tool holder is built right into the spindle of the Jig Borer. Adapters accommodate both standard and special-sized tools.

FOSMATIC JIG BORER

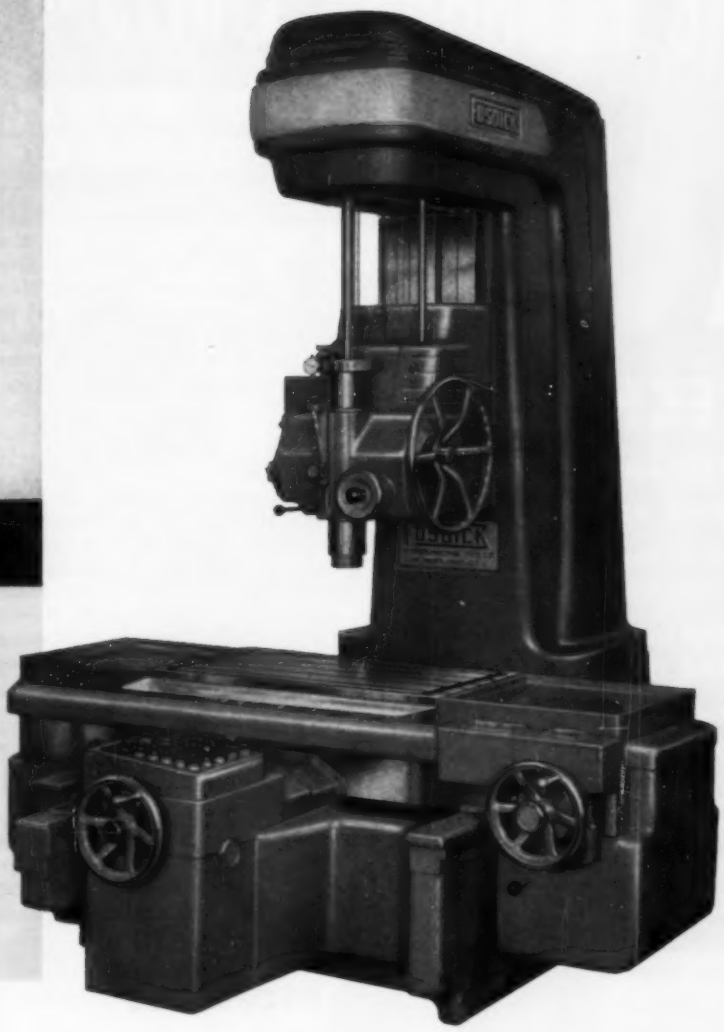
AUTOMATIC POSITIONING

DIRECT DIMENSION MEASURING



BORE

Push-button precision boring. For finish boring, change tools quickly, then bore at touch of button. The hardened alloy steel quill rides on 800 preloaded balls mounted in precision bushings located permanently at top and bottom of head—as close as possible to spindle nose for maximum rigidity. Spindle is guaranteed not to exceed .0002″ runout at the end of 12″ proving bar!



MEASURE - POSITION - CHANGE TOOLS START BORING . . . ALL IN SECONDS!

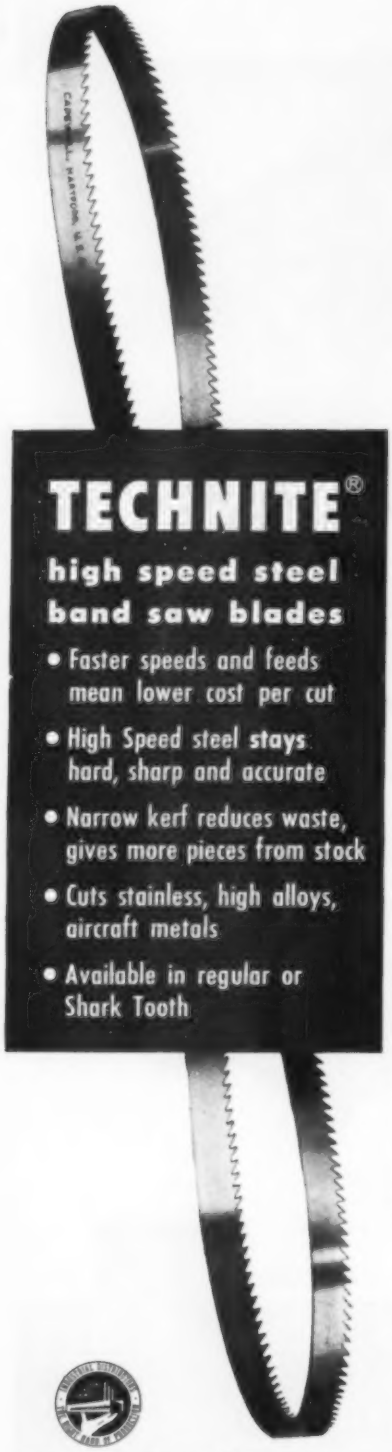
hole size and position accurate to ± .0001.

The new Fosdick Jig Borer can be used for the finest toolroom boring or for production of precision holes. Like the scores of Fosdick Jig Borers in plants throughout the United States, this machine will perform consistently to ± .0001″ . . . in measured table and saddle position as well as hole size.

The Fosmatic Jig Borer is extremely simple to operate. Changing of feeds and speeds, all movements of the table, saddle, and head can be accomplished by push button. Spindle is started and stopped by lever on head. Machine may be equipped with or without automatic positioning. Can be equipped for numerical control with either tape or card systems.

Other features available as extra equipment include Milling Feed, Rapid Traverse to Quill, coolant system and reversing motor for tapping.

Ask for Fosmatic Jig Borer Bulletin, JB-A.


TECHNITE®
high speed steel
band saw blades
• Faster speeds and feeds mean lower cost per cut
• High Speed steel stays hard, sharp and accurate
• Narrow kerf reduces waste, gives more pieces from stock
• Cuts stainless, high alloys, aircraft metals
• Available in regular or Shark Tooth
See Your Capewell Distributor
CAPEWELL
THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Electronic Training

Dear Sirs:
In your "Spot News" column (*AM*—Feb 1 '58, p81) a short article appeared announcing an electronic trainee program to be started in northern California. Would it be possible to get more information regarding this program?

Robert Burnside
Jamestown, NY

The training program is under the direction of the Electronics Apprenticeship Advisory Committee of Northern California. For further details, write the chairman of the committee: Mr Merrill B Shattuck, Director of Training, Lenkurt Electric Co, San Carlos, Calif—Ed.

Gaging Policy

Dear Sirs:

It was with great pleasure that I read your article covering the gaging policy developed at Warner & Swasey (*AM*—Dec 2 '57, p100), and I think that you should be congratulated on having written an article emphasizing one of the fundamentals of Quality Control.

However, there are some minor points in the article which the writer feels requires further clarification.

It does not seem necessary to have a master for every gage in the plant as mentioned on page 100 unless all gages in the plant are of a dial type.

I am very pleased with the important position given to the gage lab and its personnel as evidenced by the responsibilities listed on page 102, paragraphs 2, 3 and 4. I believe it is the only way to achieve the required quality in the product.

However, I have to object to the tool-proving procedure described on page 103, paragraph 2. Most people in the field of inspection believe that tool proving should be done some time before the jigs or fixtures are required for production in order to avoid possible stoppages in production. Usually it is looked after by a special section, and it should be done immediately after inspec-

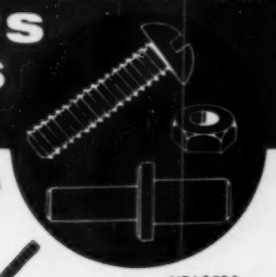
SHOPMATES

N. Jarvis

HERE ... I'LL SHOW YOU EXACTLY WHAT IT DOES SO YOU... OOPS!— YOU ALREADY GOT THE DRAIN APART ... 'SCUSE IT ...!
IT AIN'T HARD ENOUGH TO GET A LITTLE REPAIR WORK DONE AROUND HERE ... HE HAS TO DROWN THE ONLY ONE OF YOU GUYS WHO'S WILLIN' TO WORK!
N. JARVIS

FOR FAST, EFFICIENT PRODUCTION

OF BOLTS, NUTS, SCREWS AND COLD FORMED PARTS



Whether your part is standard or special — needed in mass volume or job lot quantities — Waterbury Farrel engineers can evaluate your requirements and recommend the proper equipment. As builders of the *world's largest selection* of bolt, nut and rivet machinery, Waterbury Farrel can often provide a standard machine, free of special engineering costs, to fit your need.

HEADERS
Waterbury
Headmaster
Hi-Pro
Progressive
Toggle
Tubular Rivet
S.D.S.S. Crank
S.D.D.S. Crank
S.D.T.S. Crank
O.D.D.S. Crank
O.D.S.S. Rod
O.D.D.S. Rod
Double End Rod

NUT MACHINES
Nut Formers
Nut Tappers
Blanking Presses
Chamfering Machines

SCREW SLOTTERS
High Speed
"Model 5"
Rotor Vane

THREAD ROLLERS
High Speed
Rotary
Rotor Vane
Chain Feed
Horizontal
Horizontal Side Feed
Inclined Side Feed

MISCELLANEOUS
Bolt Trimmers
Pinch Pointers
Hydraulic Presses
Rivet Drillers
Rivet Splitters
Wire Reels
Chamfering Mach.

Write for free catalogs or contact your nearest Waterbury Farrel office today.

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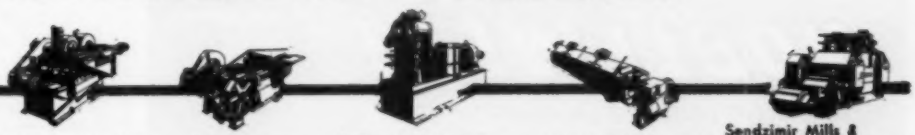
WATERBURY FARREL

WATERBURY FARREL FOUNDED 1851



Bolt, Nut & Screw Machinery | Power Presses | Rolling Mill Machinery | Wire Mill Equipment | Sendzimir Mills & Special Machinery

WF-30

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

NOBLEWEST *Precision*
ROLL GRADUATING MACHINES

WHEREVER machines and instruments require precisely graduated dials or collars for accurate setting, Noblewest equipment provides the fastest and lowest cost production method. Employing the famous **Noblewest Roll Marking Process** these machines graduate and number each piece **with machine tool accuracy** in a matter of seconds. Both graduations and numbers are **permanently indented** . . . easy to color fill . . . last as long as the part itself. Model 460, illustrated, is equipped with a unique electro-pneumatic control system for fully automatic operation. It will graduate and number dials and collars up to 7" diameter with precision and uniformity at a fraction of the cost of any other method. Can be tooled for tapered dials to approximately 20 degrees. Noblewest also manufactures **linear** graduating machines that will accommodate lengths up to 3 feet at a production rate of 25 fpm. For complete information and catalog, write Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

Noblewest graduating and scale dies are made with micro-precise accuracy. You can't buy finer . . . yet they are competitively priced.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES
NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
MARKING
NUMBERING
EMBOSSING
GRADUATING

tion has accepted the jigs and fixtures.

You also mention that gages are repaired by gage inspectors. I am of the opinion that this must be done by very good gage makers and in a section completely separated from the gage lab.

I am sure we all appreciate reading articles of this kind in your publication and hope to see more of them.

Name withheld

The master gages spoken of in the articles are gage lab masters, not production masters. Every gage in the plant—plug gage, thread gage, dial gage, and other—is checked periodically against the appropriate master, which gives a more accurate check than any other means.

As pointed out in the text, all new jigs and fixtures are delivered immediately to the inspection area to be checked by qualified gage personnel. The check is as thorough and complete as is possible without an actual production part, many of which are not received until a production run is about to start.

Gages are repaired by gage inspectors at Warner & Swasey, because the company believes the gage inspectors should be allowed to develop themselves beyond the point of being mere gage checkers. Therefore, the company has given them a chance to become well-rounded by offering additional responsibility and training—Ed.

Helpful Henry

by L. Hoppes

"If you're looking for those greasy old nuts, I threw them away. No use in getting your hands grimy twice!"

CALENDAR

American Society for Testing Materials — Annual Meeting and Exhibit, June 22-27, Statler Hotel, Boston, Mass.

Investment Casting Institute—Annual Technical Session, June 23-25, Muskegon, Mich.

Drop Forging Association—Annual Meeting, June 25-28, The Homestead, Hot Springs, Va.

National Tool & Die Manufacturers Association — Summer meeting, July 23-26, Mt Washington Hotel, Bretton Woods, NH.

Society of Automotive Engineers —Farm, Construction, and Industry Machinery Production Forum and Display, Sept 8-11, Milwaukee Auditorium, Milwaukee, Wis.

Instrument Society of America—Annual Instrument Automation Conference and Exhibit, Sept 15-19, Convention Hall, Philadelphia, Penna.

Society of Automotive Engineers —Aeronautic Meeting and Display, Sept 29-Oct 3, Ambassador Hotel, Los Angeles, Calif.

American Society of Tool Engineers—Semiannual Meeting and Western Tool Show, Sept 29-Oct 3, Shrine Exposition Hall and Statler Hotel, Los Angeles.

American Society of Mechanical Engineers and **American Society of Lubrication Engineers** —Lubrication Conference, Oct 14-16, Statler Hotel, Los Angeles, Calif.

Society of Industrial Packaging & Materials Handling Engineers —Annual Meeting and Exposition, Oct 14-16, Chicago Coliseum, Congress Hotel, and Morrison Hotel, Chicago, Ill.

American Machine Tool Distributors Association—Annual Meeting, Oct 16-17, The Sheraton Plaza, Boston, Mass.

Magnesium Association — Fall Meeting, and Exhibit, Oct 16-17, Fort Shelby Hotel, Detroit.

Metal Treating Institute—Annual Meeting, Oct 17-19, Sheraton Hotel, Philadelphia, Penna.

REED RID

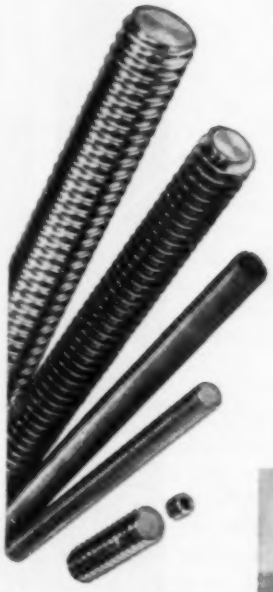
Thru-feed Thread Rolling

for Continuous Precision Threading of Long or Short Bars and Tubing and Short Headless Parts

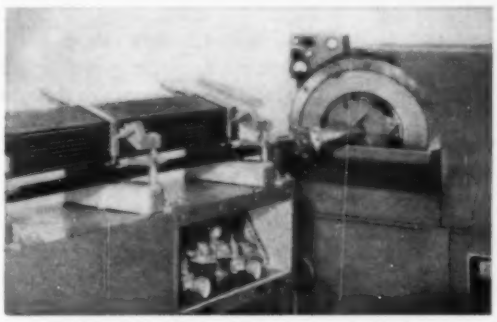
DIAMETER CAPACITIES—¼" to 3"

REED MACHINES

Provide Uniform Pitch Diameter and Accurate Thread Form Over the Entire Length of the Threads



Hollow and Solid Parts Threaded by Thru-feed Rolling



Thru-feed rolling may be used for threading both solid and hollow pieces of varying lengths and materials. Various forms may be rolled, including worms and Acme threads. Headless pieces, with threads running the entire length, may be threaded in bar lengths and then cut up into desired finished lengths.

Machines may be arranged for both manual and completely automatic loading and unloading of the parts . . . the rolling cycle with either method of loading is fully automatic. The work blank is rolled between cylindrical dies and is finally discharged at the rear of the machine. Short, headless pieces may be loaded into a chute and automatically fed, rolled and discharged. Controls are available that permit rolling the entire length, ends or middle section of a part.

Reed thread rolling machines are made in 2 die horizontal and 3 die horizontal and vertical types for thru-feed and in-feed rolling. They are rugged, of compact construction, easy to set up, convenient and simple to operate.

Operating handbooks are available so the tool engineer and operator can set up his own applications.

Write for Thread and Form Rolling Bulletin 120

REED ROLLED THREAD DIE CO.

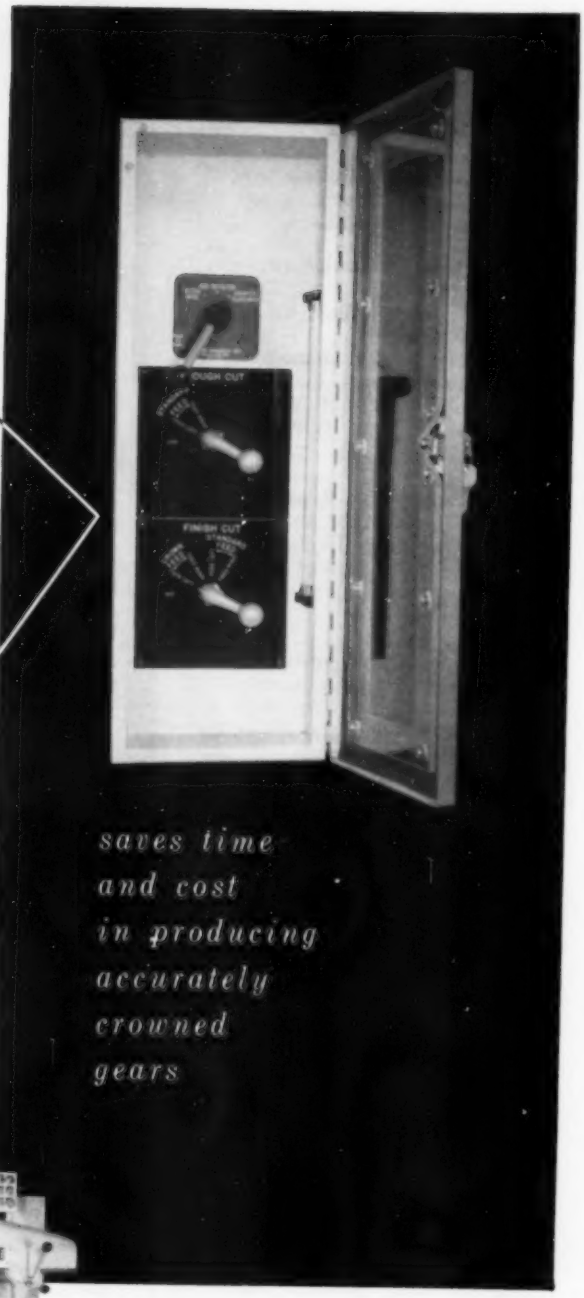
Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

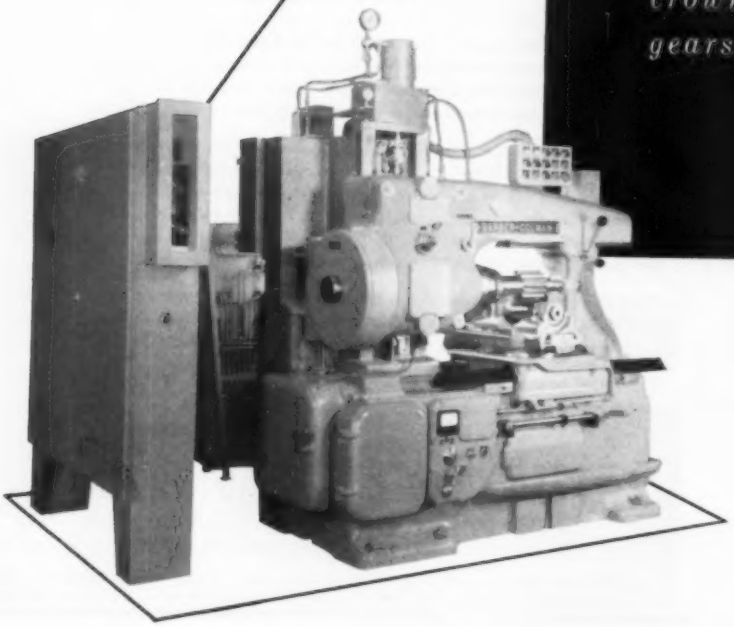
Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

crown hobbing

with automatic cycle selection



saves time and cost in producing accurately crowned gears



Fairfield Manufacturing Company, LaFayette, Indiana, is crown-hobbing coarse pitch pinions on this special Barber-Colman No. 14-15 Hobbing Machine. Crown-hobbing is a new method for generating crowned gear teeth. Whether shaving is required after crown-hobbing depends solely upon the finish required. If the hobbed finish is satisfactory, shaving can be eliminated. If shaving is required to produce the desired finish, crown-hobbing allows uniform stock removal by the shaving cutter, resulting in reduced production time and increased shaving cutter life.

This machine, especially designed and built for crown-hobbing, may also be used for standard gear hobbing. A choice of automatic cycles is available through settings on the control panel, including hobbing at constant depth and finish crown-hobbing, rough and finish hobbing without a crown, or single cut hobbing with or without a crown, feeding either left or right with climb or conventional cutting.

On the job shown here, Fairfield Manufacturing Company is crown-hobbing 3 D.P. pinions, 14T, 20° P.A., with 5½″ face and .008″ change in tooth thickness. The automatic cycle includes rough hobbing at constant depth and finish crown-hobbing. In cycling, the machine completes the conventional roughing cut, work slide raises, hob returns to starting position, and work slide lowers to finished depth against the crowning cam. The gear is crown-hobbed at a constantly changing depth, as controlled by the crowning cam, work slide raises, hob returns to starting position, and cycle stops for reloading. Cycle pattern and type of feed are selected by levers on the control panel as shown.

The machine may be designed to suit special job requirements, either as a single-purpose machine, or with the universal feature, as in this case, for both crown and standard gear hobbing. A cam and change gear mechanism for crown-hobbing is provided in the design of the machine for raising and lowering the work slide during the cycle to produce a change in tooth thickness. The work slide is held against the rotary cam by hydraulic pressure in addition to its own weight. Change gears are provided in the cam drive so that different amounts of change in tooth thickness can be produced with the same cam. Different cams can be designed when a different tooth crown configuration is required.

Crown-hobbing also makes it possible to hold a change in tooth thickness within the desired limits, and the tooth bearing can be located at the most desirable point consistent with job conditions.

We welcome your inquiries on crown-hobbing and suggest you send us drawings of your crowned-gears. Our engineers will analyze the job conditions and make recommendations for crown-hobbing. If analysis shows a practical application for crown-hobbing, we shall be glad to cut samples in our laboratory for your approval.

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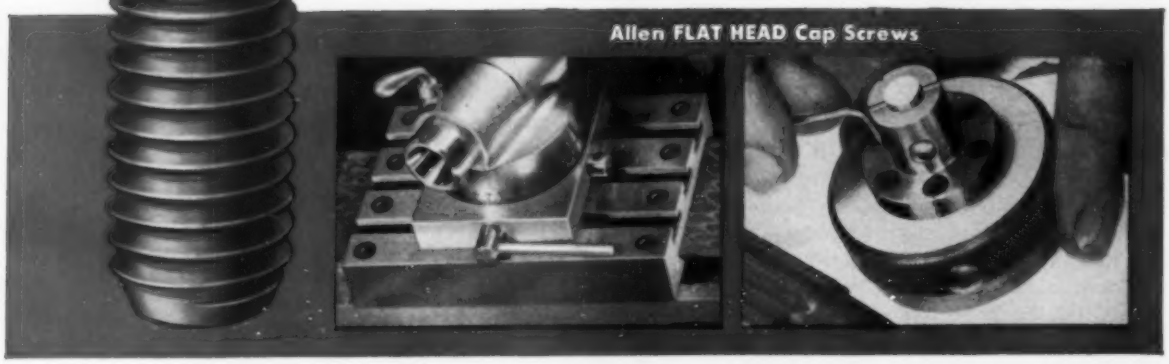
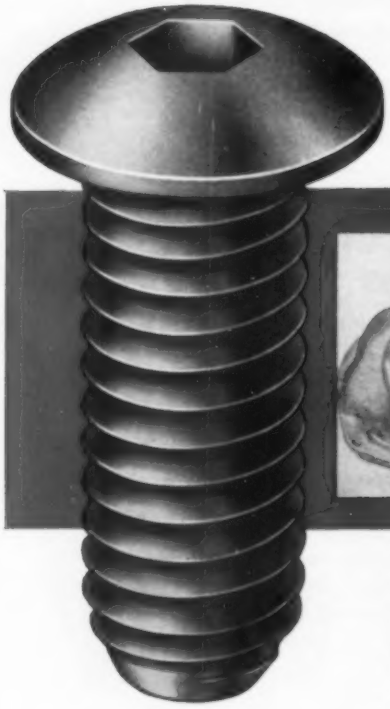
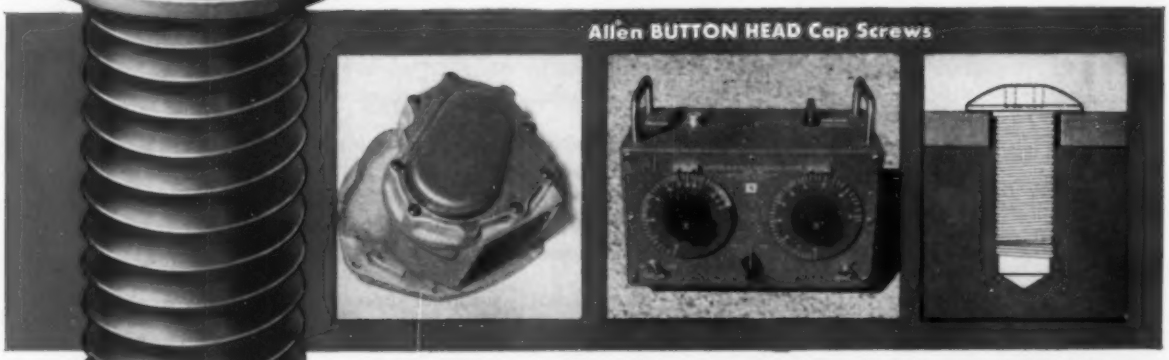
Use genuine Allen tough-gripping fastening for your flush and streamlined surfaces



Allen Flat Head Cap Screws, in countersunk tapped holes, give you absolutely flush surfaces. Hex-socket wrenching entirely eliminates burred slots and protruding heads. Genuine Allen Flat Heads are "pressur-formd"—long fibers of the metal are preserved uncut throughout the whole length of the screw. Allen's exclusive Leader Point makes starting easier—prevents damage to lead thread. Class 3A fit; available in No. 4 through ¾" diameters. Write for FREE samples, dimensions, and full details.





Where you can't countersink—fastening thin metal parts like covers, access panels or guards, for example—Allen Button Head Cap Screws will give you the smooth, streamlined effect you want. Hex-socket wrenching assures a tighter hold—eliminates driver slips, raised metal slivers, and skids that can damage and mar parts and finish. "Pressur-formd," like the Flat Heads above, for far greater strength at vital points. Leader Point. Class 3A fit. No. 4 through ⅝" diameters. Write for FREE samples and full information.

The cost of Allen Hex-Socket Cap Screws is only a minor fraction of your assembly costs . . . be sure you're getting the timesaving, cost-saving advantages of *genuine* Allens.

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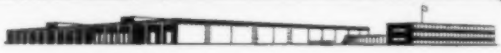
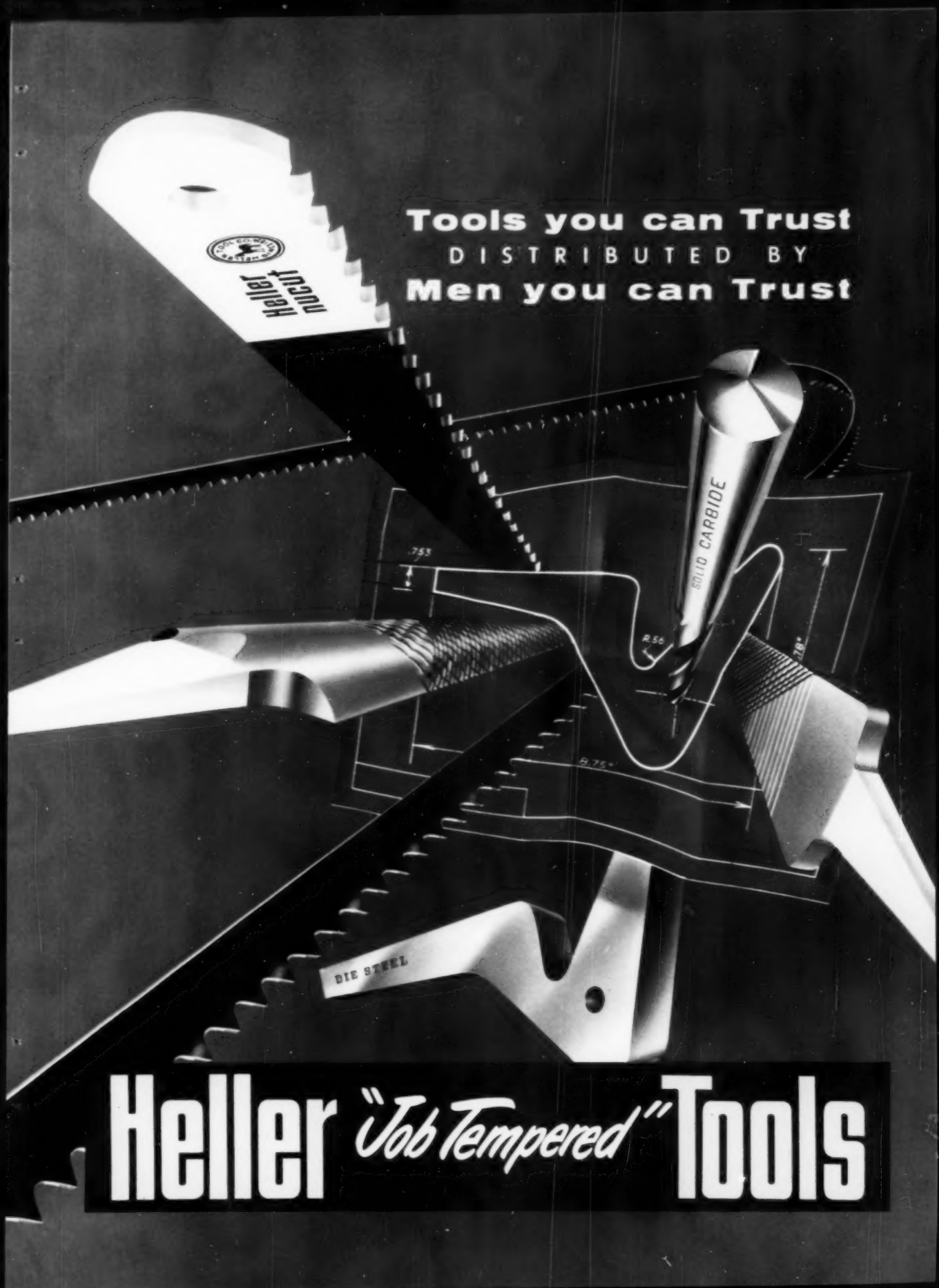
Opening in the late summer . . . Allen's new wonder plant!

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METAL CUTTING Band Saws

JOB-TEMPERED FOR LOW-COST CONTOURING! You get top production and longer life out of Heller Band Saws because Heller puts its years of tool-making experience into them. Unique heat-treating methods give job-mated steels the toughness that takes heavy stresses in stride. Special machinery and tooth setting techniques create the uniformity you demand.

CERTIFIED TO DELIVER SUPERIOR PERFORMANCE! Only Heller JOB-TEMPERED Band Saws are certified by American Standards Testing Laboratory to meet their critical standards for superior cutting: Uniform Teeth, Uniform Set, Uniform Temper.

YOUR HELLER DISTRIBUTOR HAS A COMPLETE LINE! This dependable source of cost-cutting tools can deliver the Heller Band Saws you need for any job . . . in 100′ or 250′ coils or welded to specified length. His stock includes regular and wavy set . . . standard, skip and hook tooth shapes . . . widths for all work and radii. His many lines and services are designed with your convenience and economy in mind.

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SPOT NEWS...

- **Russian general-purpose machine tools are being offered for sale** in western Europe. A Brussels distributor has exclusive license from Stankoimport for selling rights in Belgium and Luxembourg and also has non-exclusive selling rights in France and Netherlands. He started selling Russian machines from catalog descriptions a year ago. Delivery is three to six months.

- **International Harvester has ordered new tooling** to build its AC-180 truck in three wheelbases in Brazil. Engine tooling will be done by companies that furnished equipment for IH's domestic V-8 line. Monarch Products will furnish dies for cab, chassis and front-end assemblies.

- **Continuous-formed honeycomb sandwich has been developed** by Formacel Corp, Los Angeles. Strip is rolled to thickness, crimped or rolled into desired shape for cells, chopped, realigned, bonded into mat shape, and bonded to top and bottom skins, continuously.

- **Anti-white rust process for galvanized steel sheets** that does not diminish the brilliance of the sheet surface or reduce the spangle has been developed by John Summers & Sons Ltd, Shotton Works, England. The process already is in use.

- **Miniature hand magnets that simplify press feeding of thin-gage sheet or blanks** are being used by workers at Deutsche Edelstahlwerke, Krefeld, West Germany. Lifting a 38-lb load, the magnet fits into the palm of the hand and is supported by two straps. Hold is released by flexing the hand.

- **Experiments in western Europe in using controlled atmosphere of lithium** for soaking forging stock have resulted in virtual elimination of scale formation and in preventing the stock from losing carbon content. Effect is to extend life of forging dies three times. One pound of pure lithium carbonate is enough for one ton of stock soaked.

- **Direct-from-drawing contour milling has been introduced** by Rigid Ltd (Swiss). New machine has vertical milling head, 3/5-hp drive, special 55-deg head, slotting attachment, and device for grinding. Speeds and feeds have wide ranges with stepless adjustment. Milling can be done both vertically and horizontally.

- **Three all-aluminum engines,** made of alloys with higher wear resistance than cast iron and with coatings better than chrome plate, have been hand-built by General Motors. Main aim is lower cost, partly from less machining. The engines include castings and weldments.

- **Chrysler is setting up a production line for the 1500-mile Jupiter missile** at its Warren, Mich, plant, but some Jupiters will also be fabricated at the Army's Redstone, Ala, arsenal with Chrysler-built parts. Douglas Aircraft is producing the Thor at its Santa Monica, Calif, plant. This gives the United States two intermediate-range missile production lines.

- **Foreign car sales in U S will be around 300,000 units this year** and next year will not go over 350,000, George Romney, president American Motors, predicts. He feels that coming volume market is in the compact car area represented by the larger Rambler. Americans want greater driving comfort, roominess and performance than European cars give them.

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U.PDATE—MODERNIZE
RIGHT IN YOUR OWN PLANT

H833

MORE SPEED, CONTROL AND VERSATILITY FOR YOUR PRESENT H-P-M PRESS

Do you know it is possible for you to up-date your present H-P-M press right in your own plant . . . speed it up . . . improve cycle control . . . add extra versatility? Yes, we've done it many times which in most cases solved a specific production problem. Perhaps you have such a problem where a few press changes will "put you in business." If so, please contact an H-P-M press representative or call us direct.

Listed below are the many changes possible:

For More Speed—Add pump capacity to your present system—either by changing pumps or by adding extra pump volume.

For Improved Control—Electrical systems for semi-automatic or completely full automatic control of cycling actions replacing manually operated controls. Electro-Servo systems for infinite step speed control.

For Added Versatility—Convert standard cycle presses for adjustable slow-down, dwell or holding cycles.

- Add die cushions for drawing or forming.
- New bolsters (sliding) for new applications or additional tooling.
- Lengthen daylight.
- Re-machine guided parts for greater accuracy.
- Increase bed size (front to back) to accommodate new tooling and larger parts handling.

THE HYDRAULIC PRESS MFG. COMPANY

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HPM

WASHINGTON...

The key economic problem...

Inflation, not recession, is the key economic problem Washington is worrying about today. Government administrators and law makers alike now see the rising climb in prices an even bigger threat than the present state of the recession.

Unemployment is down; and employment in manufacturing is steadying. Materials buying is increasing, significantly in steel.

The metalworking industry may be caught in a squeeze. Washington is concerned about a rise in materials costs, particularly steel, this summer, at a time when business may be just beginning to start an upward climb. The fear is that higher prices might discourage new equipment buying and production. Washington is trying to discourage a steel price increase, but an automatic one seems inevitable as a result of an automatic wage rise this summer.

End to pump priming...

Washington is putting the lid on pump priming activities. Congress is moving slowly on plans to increase spending. There is agreement between Congressional leaders and the administration to oppose general tax reduction. This includes a decision to oppose depreciation reform, a decision that will stand unless sentiment favoring reform can be built up swiftly in the House and Senate.

Ideas to plug the inflationary move range from cracking down on union labor's bargaining power, to amending the anti-trust laws to make administered prices and so-called "price leadership" illegal.

They are all geared to the belief that the kind of inflation experienced during the 1955-57 boom, and the tendency of some prices to keep on rising during the recession, are signs of fundamental change in the U S economy. What Congress is looking for are anti-inflation weapons more palatable than direct price and wage controls, and more effective than money and credit restriction.

In the mill now...

Sen Estes Kefauver's Anti-Trust and Monopoly Subcommittee of the Senate Judiciary Committee is looking at pricing practices of industry. It has reported on the steel industry and soon will report on automobiles and roofing materials.

Industry's view...

Here is how industry views the situation. The results of a Congressional committee poll of 28 of the nation's top industrialists and financiers made between March and May:

- **The current recession** appears to have done its worst and is not going to degenerate into depression.
- **The federal government** should proceed cautiously, if at all, toward priming measures such as tax cuts or big public works outlays.
- **Organized labor** must be put under more restraint if a semblance of overall economic stability is to be attained in the future.
- **Tax reform,** as opposed to an immediate anti-recession tax cut, should become a key Congressional goal, with emphasis on encouragement of capital formation and risk-taking investment.

Taxes and depreciation...

The outlook for Congressional action on taxes and depreciation, therefore, shapes up like this:

There will be efforts by individual members of Congress to revive general cuts but this action has no chance. Depreciation reform is likely to be sidetracked unless unexpected support for it suddenly appears. The legislators may, though, extend fast write-off provisions of the 1954 Act to used machinery. Excise taxes on transportation may be lifted. But that is about all to expect. Up to the last week in May, prospects looked good for something more. The Treasury Dept was interested in proposing technical changes in the depreciation rules.

Treasury Secretary Anderson then decided to ask Congress for a simple extension of existing excises. This dimmed if it did not completely eliminate any prospect for depreciation reform backed by the administration. The Treasury theory is that it doesn't dare ask for any changes in the existing laws without inviting a flood of additional changes from Congress.

In case no liberal-depreciation law is enacted, the pressure for it will continue next year. The argument will be that the rate of recovery will be painfully slow otherwise.

Several bills on file with Congressional committees call for faster write-offs of new plant and equipment costs, but they are believed to have a fighting chance. Several of these merely liberalize the provisions of Bulletin F, the Treasury's guide to acceptable useful life of property and equipment.

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DETROIT...

Union blues . . .

Big Three labor contracts expired amidst charge and counter-charge a little over two weeks ago. Each side blamed failure of the other to "bargain in good faith" but worker productivity in the unfamiliar atmosphere of an open shop started out as good if not better than before.

In general, the companies pledged to continue provision of the old contracts with some important exceptions. Union dues will no longer be checked off, nor can they be collected by shop stewards on company time. Workers no longer have to stay in or join the union as a condition of employment. Stewards and committeemen had time allowed for performing union duties chopped in half. Hourly-rated workers were denied the 2¢ per hour cost of living increase and the nearly 7¢ productivity hike that would have been in June 2nd pay envelopes had they accepted the companies' offer to extend the old contract.

The Big Three are practicing solidarity, formerly a UAW trademark. There are only slim signs that they will enlarge upon their offer of two-year contract extensions in the foreseeable future. But this future includes new model changeover time, due to start as early as July.

Early-Bird 1959 makes will start rolling down the lines by August. Then the industry will be vulnerable once again. A strike at that time would be a strong possibility were it not for the depleted UAW treasury. An alternate tactic would be to strike suppliers.

Management is not necessarily happy that Walter Reuther decided to wait it out rather than give in. His position will inevitably be strengthened with time, and his only real problem one of tight discipline. Therefore continued discussions offer some hope of a settlement.

Planning in a vacuum . . .

Facing uncertainty on both labor and consumer fronts, automakers are understandably cautious in programming 1959 model production. Body tooling costs for GM and Ford will probably set an all-time record when announced, but the designs were committed two years ago. They are merely variations on a theme that obviously isn't attracting enough buyers.

General Motors' lines should move again by mid-August after a shutdown starting as early as the last week in June. Chrysler Corp is figuring on an early September date. Ford, after some delaying last-minute changes on its body shell (also common to Edsel and Mercury), faces a late September start-up.

These dates tie-in with unusually early auto show schedules. The Detroit auto show, normally held at the end of January, has been moved up to Nov 22. If GM goes through with its plans for Motorama, it will be previewed in New York on Oct 14.

Auto steel buying continues on a monthly inventory basis. There has been no stockpiling to beat the expected price increase, mostly because the industry has found that savings from "playing the market" are soon eaten up by storage, handling, and deterioration costs.

With dealer stocks firmly under control, initial '59 model production schedules will be geared at a 6-million per year rate to fill the pipeline. Then automakers will adjust to meet demand, and the adjustment most likely will be downward.

Perhaps the biggest problem facing Detroit in 1959 will be keeping the dealer body substantially intact. The latest NADA survey shows that the average dealer was 0.8% in the red during 1958's first quarter. It can only be worse for the second and third quarters. Many old timers are quitting the business to keep their capital intact, and it is hard to attract replacements.

Preview of 1959 . . .

Biggest change will be styling. With the entire GM line sharing a single body shell, much emphasis will be on product differentiation through varitions in outer panels. Chrome will highlight the sculptered effects, not just be used for its own sake. Ford fins will lie almost flat on their sides.

Variations in dual headlight arrangement will keynote front-end treatments. Plymouth fins will start just aft of the front door and flair rearward, reminiscent of the experimental "Dart" show car. Other makes than Chrysler will offer rear-facing seats in station wagons.

Glass makers are happy with the almost universal application of compound windshields and deck lights. Air suspension will be continued but in modified form on some cars. Chrysler and Ford, for example, will restrict the option to leaf-assisted air bags on rear wheels only.

It will be a year of styling, but unfortunately, just more of the same. There isn't a new engine in the line-up; existing ones will be rehashed for more economy. Horsepower and compression ratios will hold the already adequate line.

51% More Production

when drilled with the

BENCH MODEL BURGMASTER®
Turret Drilling Machine

JOB DATA:

Part: Gas furnace pilot burner head.

Location: General Controls Co., Glendale, Calif.

Material: Type 2202 stainless steel.

Operation: Drill 10 holes No. 56 drill size.
Drill 1 hole No. 42 drill size.
Drill 1 hole No. 37 drill size.

All hole positions indexed radially around jet axis. Turret is double tooled.

Former Method: Production—58 pieces per hour, standard, on a 3 spindle gang drill. Fixture was progressively moved from one spindle to the next on 8' table.

Burgmaster: Production—88 pieces per hour, standard, with actual production running 130% over standard. Operator fatigue greatly reduced. All holes now drilled from one operator position on a stationary rotating fixture. Floor area requirements per machine reduced 50%. Based on savings alone this machine paid for itself in less than 5 weeks!

Paid for itself out of savings in less than 5 weeks!

THE BURGMASTER TURRET DRILLING MACHINE speeds all second operations—*center drills, drills, reams, taps, spot-faces, countersinks,* and *counterbores!*

SELF-INDEXING—Turret instantly power-indexes to successive station after each individual operation is completed!

6 STATIONS—Only one live spindle! Each spindle operates at its own predetermined speed. Two complete ranges cover 350 to 6200 rpm.

¼" CAPACITY IN STEEL—Larger hole sizes in softer materials.

For *more* parts per hour, for *lower* costs, put your second operations on a BENCH MODEL BURGMASTER TURRET DRILLING MACHINE! Here's a tool that not only produces more parts faster... it costs *far less* than conventional equipment often used for the same job! Write for circulars and specifications!

Want to see the Burgmaster in action? We'll arrange a free demonstration in your plant upon request!

BURGMASTER BENCH MODEL 6 SPINDLE AUTO INDEXING TURRET DRILL & TAP MACHINE

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AIRCRAFT and MISSILES... TRENDS

Weapon system management . . .

The Pentagon is taking a close look at the highly touted "weapon system management" scheme. Observers guess that the plan will be shaken down some, that new limits will soon be clamped on the powers of prime contractors on missile or aircraft projects run under weapon system management.

Under this scheme, control over a weapon development or production project is centralized in one prime contractor—with a minimum of government interference. The prime has responsibility for the design and production of an entire plane or missile and all its components.

The prime builds much himself, farms out some work to subs, assembles the product, even directs crew training and supervises installation and maintenance. The system was conceived to simplify and speed development of the more complex new supersonic planes and missiles.

Now, many Defense Dept officials are having some second thoughts about the system. They complain that the services have "abdicated control" over projects to the primes, and that as a result development costs have mushroomed. Their chief gripe—many weapon system primes are duplicating each other's ground support equipment and important components.

Submarine-fired rocket . . .

Any day now, the Navy will let a $60-million contract spread over a three-year period to develop a submarine-fired rocket—the Subroc. This is touted as the hottest anti-submarine weapon the military has on the drawing boards.

The weapon will be fired against enemy subs from underwater. It will surface and travel through the air to the sub, then re-enter for the kill.

Strike settled . . .

Production workers at Rheem Mfg Co's Aircraft Div, Downey, Calif, returned to work June 2 ending a strike which began on May 21. The 1150 employees, members of the United Steelworkers of America, accepted a two-year contract granting pay raises, a cost of living escalator clause, and an additional holiday.

California counts on missiles . . .

The only apparent bright spot on Southern California's employment horizon is the slight upturn in missile employment. Among the aircraft manufacturers, the downward trend is continuing.

The lapse between fading production of piston-powered aircraft and the very gradual build-up of missiles and jet-propelled craft continues to leave labor stranded. Although missile producers are generally optimistic it is characteristic of this industry that fewer workers are needed than for aircraft manufacture.

Outlook brighter in South . . .

An upturn in work is expected shortly at Lockheed's Marietta, Ga, plant. Employment stands at about 13,000 (down about 5000 from last August), but a company official said that the division was just ready to recall some of its laid off workers when the recent strike began.

This division has been making every effort to land some missile and nuclear work. If the hope for new work materializes, as now appears likely, recalling of workers will begin shortly. There's no hint as to the type of work and no figures have been given on the number of men to be rehired. Nor is there any assurance of an upturn in the letting of subcontracts even if the new work is secured.

The new contract, reached after a ten day strike involving approximately 8000 IAM members, is a two year contract giving a blanket increase in pay, ranging from 18¢ to 30¢ an hour, and an additional 3% wage increase or seven cents an hour, whichever is greater, at the beginning of the second year.

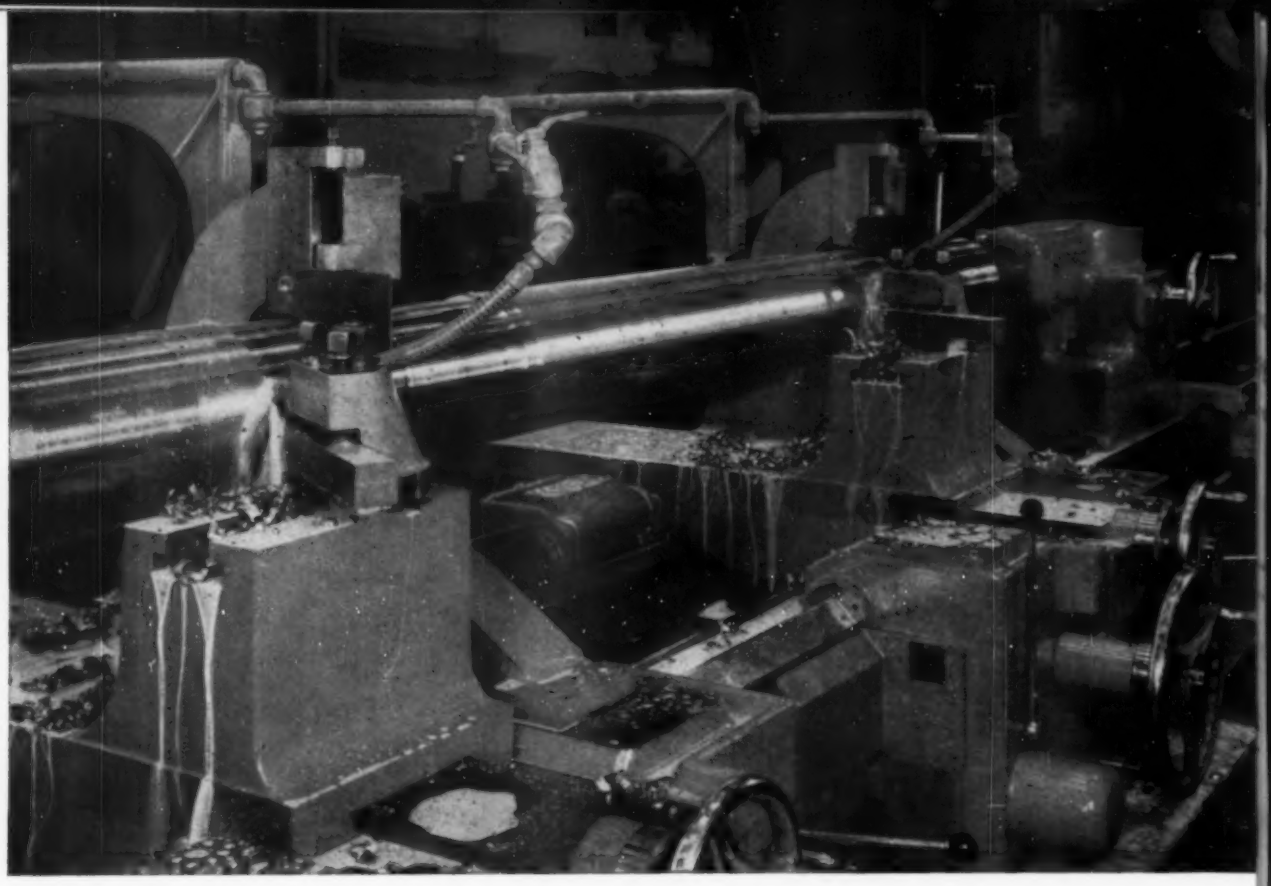
Rohr Aircraft, Winder, Ga, one of Lockheed's subcontractors, reports a stabilized employment level. It's expected to stay that way in anticipation of the upturn of work at Lockheed.

Subcontracts on the rise . . .

Letting of subcontracts has jumped markedly in the past few months, says the president of Hayes Aircraft, Birmingham, Ala. And he expects the rise to continue. Hayes makes among other things missile parts and launching equipment for the Jupiter missile under a subcontract from Chrysler Corp.

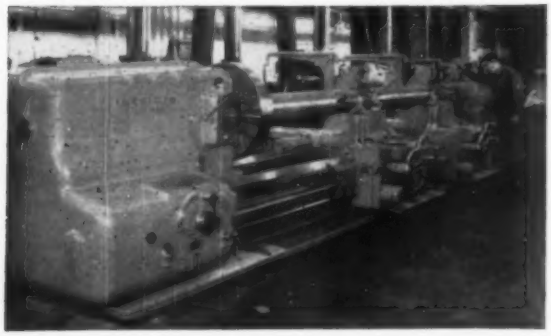
An official at Glenn L Martin, Orlando, Fla, says that Martin's subcontractors are not "hungry" and that he has heard of no folding up among any of them. This new plant, which employs about 3500, reports constantly increasing subletting and fully expects the trend to continue.

No cutbacks in letting of contracts are reported at Redstone Arsenal, Huntsville, Ala. Nor are there any subcontractors folding in this area.



● *Cutting with two Carriages equipped with plain block rests and follow rests.*

MACHINING TITANIUM BILLETS



● *32 inch "American" Double Carriage Pacemaker Lathe.*

An extremely difficult job — a real challenge to the rigidity, stamina and "staying" qualities of any lathe.

Cutting titanium offers terrific resistance to the cutting tool which in turn demands maximum rigidity of the tool supporting members in order to hold vibration to the very minimum; otherwise chatter and high tool mortality are inevitable.

The fact that all of the major titanium fabricators are using "AMERICAN" Lathes, selected only after repeated demonstrations, is conclusive testimony to the power, stamina and rigidity of these machines.

There are exclusive features which definitely contribute to this result, such as the wide, four vee bed with walls rigidly tied together between the girths by an angular web which forms a chute for quick disposal of chips; replaceable hardened tool steel vees; solid 3-vee mounting of the carriage on the bed; powerful headstock with triple bearing spindle and bearing adjustment from the outside and others which space limitations prevent mentioning.

For a complete description of all of these features just send for bulletin No. 144.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

MACHINE TOOLS...

Russia places big machine orders . . .

West German machine tool builders are to supply Soviet Russia about $35 million of machine tools annually for the next three years, according to reports filtering in from West Germany. This $105-million deal is said to be part of a larger trade agreement between Moscow and Bonn whereby West Germany is to export close to $700 million of industrial goods to Russia from now up through 1960.

The Russians are believed to have submitted already a "list of wishes" (shopping list) so that various West German industries will know what to expect. Stankoimport, Russian buying agency, is to set up an office in Cologne. West Germany, however, will not establish a comparable agency in Moscow.

Russian down payments for many German orders are said to be at German banks. Terms are reported to call for complete payments prior to deliveries. But the specifications that the Russians have laid down for acceptance of machines are reputed to be stricter than before the war.

Some West German builders have been awarded Russian orders independent of the new agreement. Total Russian outlay in the three-year period for German machine tools is likely to exceed the amounts stated in the agreement.

Nevertheless Russian purchases will not be as large as back in the 1930's, because Russia now has a big machine tool industry of its own.

Russia to export machines...

Russia is reported to want to export from her own production as many standard machine tools as possible to China, India and other countries. Meanwhile she will acquire high-grade German machines for her own use.

This Russian-West German transaction is looked to as giving positive support to the West German machine tool industry the next few years. Negotiations that led to the present relationship probably got started in the summer of 1957 when a group of prominent West German machine tool builders made an informal visit to Moscow upon invitation of high Soviet officials.

Russia has been offering standard machine tools for sale in western Europe the past year through a Brussels distributor who has an exclusive license from Stankoimport for Belgium and Luxembourg and a non-exclusive license for France and Netherlands.

Delivery promises of three to six months are being made for lathes and other standard machines, and of eight months on elephant tools.

The Russians are reported to have said that they have not yet started serious price competition. But they can take orders at as much as 40% below German prices and not lose money.

Landis Machine buys British firm . . .

Landis Machine Co, Waynesboro, Pa. has bought the controlling interest in Maiden & Co Ltd, Hyde, Cheshire, England, which makes Maiden threading machines. Plans are to double immediately the plant capacity which now totals 14,000 sq ft of floor space.

The British company will continue to make Maiden threading machines. The new plant addition, however, will be devoted to production of Landis chasers for Landis die heads, the die heads being distributed from the British plant. Chasers will be supplied not only to United Kingdom customers, but also to export markets, particularly continental Europe. Later on, the British plant will build popular sizes of Landis threading machines. J M McNeal, export manager of Landis, will be chairman of the British company but will maintain his headquarters at Waynesboro. G Barry Tinker will be the managing director.

Distributors put on shows...

Motch & Merryweather Machinery Co staged a big Machine Tool Show at its Euclid, Ohio, plant the week of June 2. The show, which had in operation some 60 machine tools, drew an attendance of more than 3000. Products of 19 machine tool builders were represented. Motch & Merryweather also showed its own new machines. For detailed story, turn to p 96.

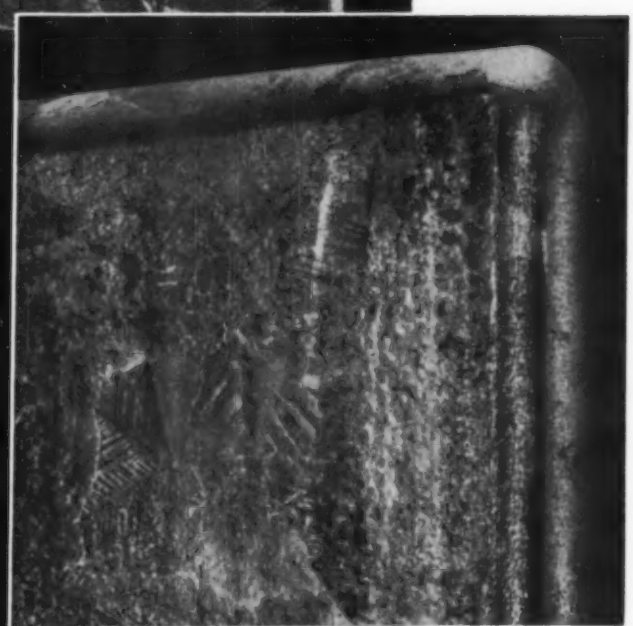
George M Meriwether Inc, Birmingham, Ala, distributor, recently put on a machine tool show sponsored by 12 builders. In addition to civilian customers, government men from as far as 300 miles distant attended the show, and so did engineering students from universities and from vocational schools nearby. Jerome A Raterman, president Monarch Machine Tool Co, and Ralph J Kraut, president Giddings & Lewis Machine Tool Co, talked to leading bankers and industrialists at a morning session.

BF

Handkerchief fold

on USS Galvanized Steel Sheets

proves the zinc stays on



These are unretouched pictures of twice-folded USS Galvanized Steel Sheets. The sheet in the smaller picture is magnified three times actual size.

We cut a piece from a sheet of USS Galvanized Steel—bent it double—
then we bent it double again.

But look at the zinc coating along the outside of the bend. Not one bit of the coating flaked off! What's more, we restraightened the sheet and still not one speck of zinc came loose!

This kind of adherence means you can fabricate USS Galvanized Steel Sheets in ways you may not have thought possible.

Unless otherwise ordered, USS Galvanized Sheets are chemically treated to inhibit the formation of white oxide—sometimes called humid storage stain.

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
American Steel & Wire – Cleveland
United States Steel Supply – Steel Service Centers
United States Steel Export Company

United States Steel

USS
TRADEMARK

MATERIALS... TRENDS

New alloys introduced...

Hardness and high permeability are combined in two aluminum-iron alloys now being produced commercially by the Carpenter Steel Co. Called 12 Alfenol and 16 Alfenol, they contain 12 and 16% aluminum, the remainder being iron. The "nol" part of this name stands for Naval Ordnance Laboratory, where the alloys were developed a few years ago.

12 Alfenol now is available in strips from 0.002 to 0.020 in. thick and 16 Alfenol will go into production in the near future. While present cost is about $30 a pound, these materials someday may challenge nickel alloys in certain applications. While their magnetic properties are somewhat lower than the properties of nickel, the Alfenols stand up better under abrasion.

Alfenol strip 2 mils thick has been tested successfully as control tape and in magnetic amplifier applications. Thermonol, an alloy of Alfenol with molybdenum for high - temperature strength, also is slated for future commercial production.

Two new alloys for aircraft...

For jet-aircraft turbine and gas turbine uses, Allegheny Ludlum has developed two alloys bearing the designation D-979 and AF-71. They are intended for compressor parts, turbine buckets, wheels, spacer rings, fasteners and those parts requiring similar properties. Other possible uses include rocket and ram-jet parts, automotive gas-turbine blades and wheels, and parts for missiles.

D-979 is a nickel-based alloy produced in a consumable-electrode vacuum melting furnace. Samples of it are being tested by a number of aircraft and auto engine manufacturers.

AF-71 is an iron-chromium-manganese alloy having high physical properties and a low strategic-alloy content. It is produced in conventional arc furnaces and is relatively less expensive than other high-temperature, high-strength alloys. Both alloys are expected to have considerable commercial success. Just as a number of the "tool steels" are proving valuable for aircraft applications, it is likely that some of these new aircraft alloys have interesting potential properties as tool materials.

Miniaturization goes commercial...

Look for a considerably expanded market in miniature components for consumer products during the next 24 months. TV designs, including the use of the new short, short-neck picture tube, which will appear as products before the end of the year, are startlingly new and attractive. From an "attache case" size portable to a set having a simple "picture-frame" picture tube on one side of the room connected by a cable to all the rest of the equipment in a 6 x 12 x 18 in. box on a table next to the viewer sitting across the room, miniaturization is changing TV from focal-center furniture to utilitarian.

These changes will importantly influence electronic metalworking. According to engineers at the IRE Professional Group Conference on Production Techniques (New York, June 4-6), component designs and materials will change to facilitate mechanized manufacturing, use of printed circuits will further expand, and much must be done to develop and improve high-production manufacturing equipment. Smaller sizes introduce new problems in handling.

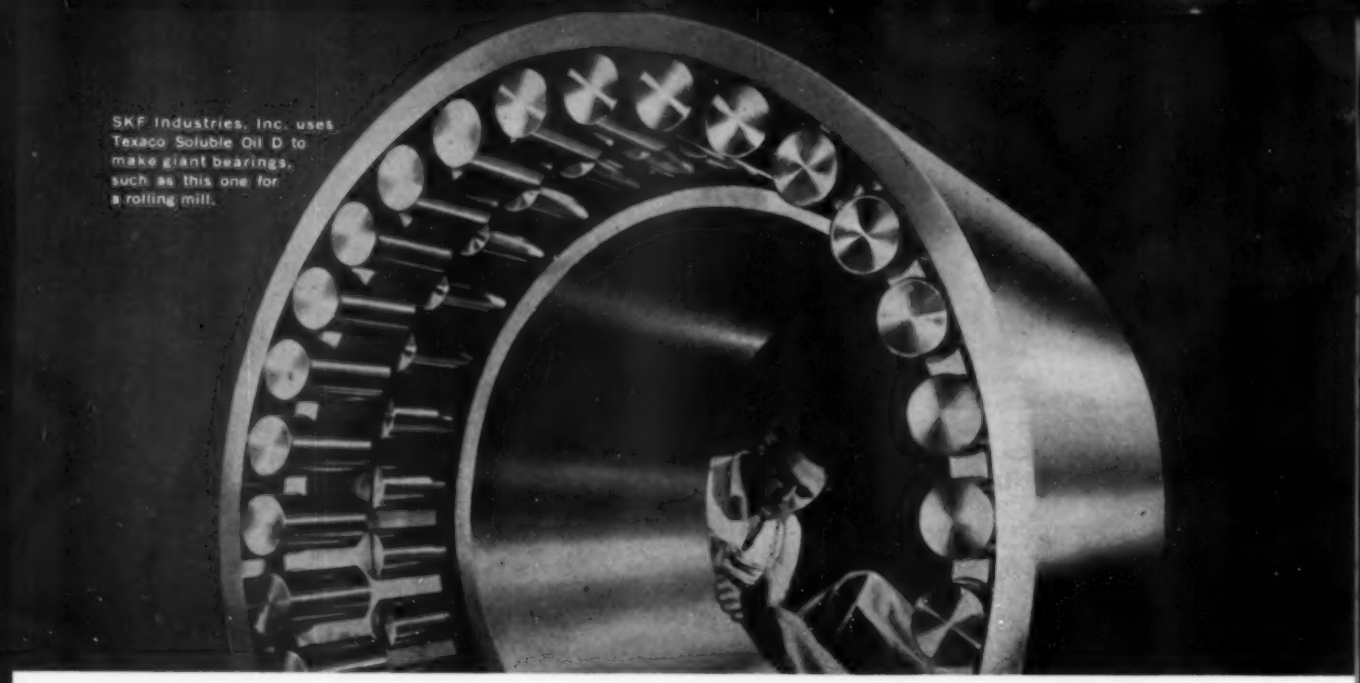
Soldered connections...

Mr E Plesser, Facilities Engineer for Philco Corp, said in an IRE talk that the company has not received a single production complaint about 60-40, or eutectic, solder connections. All of the other methods tried, such as solder plating, have caused problems in varying degrees. Mr Plesser also recommended high temperature and rapid dipping (provided components don't blister) as the best technique—with a minimum of 520 F for good solderability. Degassing of the molten solder, or evaporation of flux, can cause bubbling or blistering of the solder itself at the joint, hence a weak connection. This problem can be avoided by vibrating the work during the soldering operation.

Anti-friction screw smallest yet...

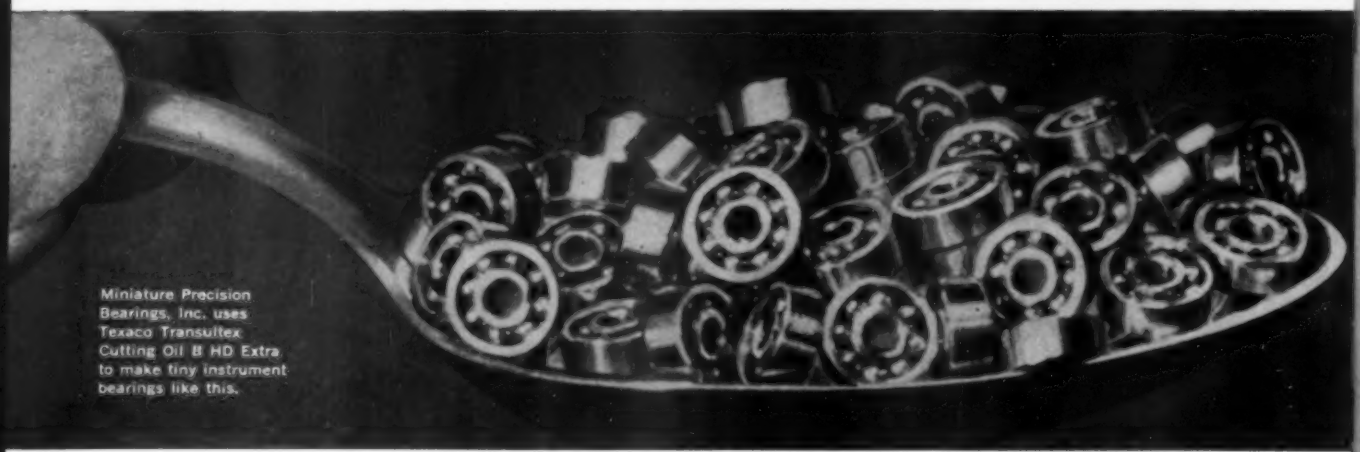
A miniature, lightweight ball-bearing screw with only 3/16 in. ball-circle diameter, and providing up to 90% and more efficiency, has been developed by the Saginaw Steering Gear Div of General Motors Corp. In addition to providing substantial savings in space and weight, the screw will operate at near maximum efficiency at temperatures as low as –65 F, and it will position components to within 0.0005 in. for each inch of travel.

Special ceramic coatings fused to advanced metal alloys will some day be able to withstand 5000 F — half the heat of the sun — predicts Nathaniel Cannistraro, vice president of Bettinger Corp. Such combinations can now hold up for short periods at 3000 F. One more immediately practical application will be coated auto mufflers.



SKF Industries, Inc. uses Texaco Soluble Oil D to make giant bearings, such as this one for a rolling mill.

WHAT SIZE IS YOUR MACHINING PROBLEM?



Miniature Precision Bearings, Inc. uses Texaco Transultex Cutting Oil B HD Extra to make tiny instrument bearings like this.

If you make anti-friction bearings of any size, you need grinding fluids that prevent rust and produce uniformly fine finishes. These fluids must also take into account the bearing material and the operating condition of your machines. They must have specific stability, cooling properties and ability to settle grinding dirt quickly. Otherwise your production drops and the number of rejects rises.

The makers of the small and large bearings shown above get fine bearing finishes and high production by using Texaco. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to help improve machining on every job.

Take this tip. Use Texaco Cutting, Grinding and Soluble Oils—they'll help you produce faster, better and at lower cost, whether your product is the largest or the smallest.

Let a Texaco Lubrication Engineer suggest the best ones for your jobs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

WHAT'S AHEAD... in Metalworking

TRENDS

Output to stay fairly high...

Metalworking production is heading into a summer of slackened activity. Nevertheless operations will be kept at a fairly high level. Judged by any other standard than a few recent boom years, the promised performance will be good.

July is bound to feel the effects of vacation plant shutdowns. This year the vacation periods are likely to be longer than for the past several years. That will be especially true of the automobile industry, as companies retool for new model production.

Steel mills report increased bookings, some of the gain stemming from a desire by users to beat the July 1 deadline for a price hike.

A lot of little orders from a miscellany of buyers leads to the belief that inventories are being used up and customers now are having to purchase as much steel as they are using.

Some steel customers, in fact, are not getting as speedy delivery as they did and hence are beginning to place requirements a little further ahead. The steel market still is without support from the automobile industry. But General Motors is expected to start asking for mill deliveries before the end of July for 1959 models to be introduced early in October.

Rundown of steel demand shows that tin plate, galvanized sheet and cold-rolled sheets are doing fairly well. Structural shapes, plates and bars are moving slowly.

Steel warehouses have the largest stocks of all kinds of steel in many years. At current rate of ordering, jobbers have at least a nine-months' supply.

Gray iron foundries are running at somewhat better than 50%. No immediate improvement is in sight. The same general situation prevails in the steel castings business.

Bearings makers report their sales are down considerably. Farm equipment companies and replacement orders in general are the best sources of sales.

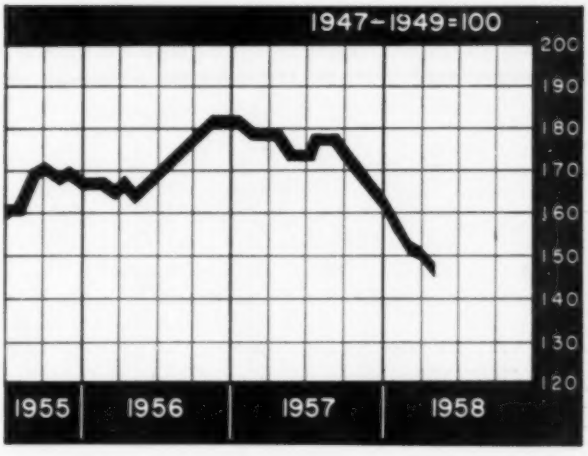
Farm equipment industry is doing relatively well. Most of the improvement was in late March and April, with sales of threshers and hay balers especially strong. This gain more than offset the decline the previous four months.

Heavy electrical goods are looking up. Orders for turbines and power transformers, for instance, are expanding. Nevertheless production of such products is down from the 1957 level. Big process-equipment units, on long-term manufacturing cycles, are suffering from slackened demand.

Automotive parts makers are playing production schedules largely by ear and on a day-by-day basis. A few companies are on two shifts, but employment is way down and plants don't know at the week's beginning whether they will be working five days or four. One valve maker has gone back to five days because auto companies have placed firm orders for valves required to clean up 1958 models.

Aviation parts firms are moderately busy and see little change ahead during the summer.

Slow retail sales of home appliances have played hob with manufacturers' schedules. It seems unlikely that demand will show much if any improvement until fall. Appliance makers are banking on a good pickup in the fourth quarter.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

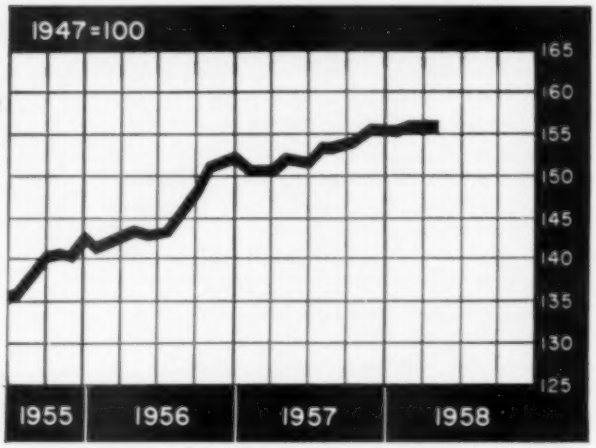
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**147**	**148**	**150**	**176**
Machinery	**125**	**127**	**152**	
Electrical Machinery	**169**	**170**	**196**	
Autos	**85**	**94**	**127**	
Other Transportation	**338**	**333**	**375**	
Other Metalworking	**128**	**130**	**145**	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**155.9**	**156.0**	**156.0**	**151.9**
Metalworking Machinery		**182.3**	**182.3**	**176.5**
Other Machinery exc. Electrical		**166.1**	**166.0**	**160.6**
Electrical Machinery		**157.9**	**157.5**	**153.9**
Fabricated Metal Products		**146.6**	**146.6**	**143.4**



Leveling off period now at hand . . .

Recent economic statistics give heartening evidence that the business decline has slowed down markedly and that the leveling off period is now at hand.

Since inventory liquidation accounted for 2/3 of the $18 billion drop in gross national product from the third through the first quarter, the April figures on manufacturers' sales and inventories are particularly encouraging. Both sales and inventories fell from March to April. But for the first time in many months, inventories declined more sharply than sales, slightly lowering the inventories to sales ratio.

The improvement in the ratio does not spell an end to inventory runoff. Businessmen will probably continue to liquidate stocks for several months yet. But it does indicate that liquidation will proceed at a slower rate. And, with final sales holding up well, even a reduced rate of runoff will give a boost to production.

Here are other encouraging omens on the economic scene:

- **The steel operating rate** in the first week in June edged over 60% mark and the industry expects the June average to be 65%. In early May was operating below 50% of capacity.
- **Housing starts,** seasonally adjusted, increased by 70,000 units from March to April. Futhermore, applications for government backed home-building mortgages shot up dramatically in April—a promising augury that residential housing will become an increasingly buoyant force in the economy throughout 1958 and in 1959 as well.
- **New orders for machinery,** though still at a low level, turned up in April. The improvement here lends support to the belief that capital spending will level off in early 1959.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Actvity (1947-49=100)*	126.8	125.2	144.8
Steel ingot production (thousand tons)	1,641	1,567	2,240
Electric power output (million Kilowatt hours)	11,000	11,316	10,936
Production of automobiles and trucks	92,263	112,909	110,867
Engineering construction awards (Eng. News-Record, millions)	$481.3	$424.0	$442.7

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	261	228	309
Vacuum cleaners sales (thousands of units)	291	226	313
Washers sales (thousands of units)	279	263	286
Household electric ranges sales (thousands of units)	71	75	72
Radio production (thousands of units)	931	877	1609
Television production (thousands of units)	427	370	560
Gear sales index (1947-49=100)	N.A.	175.3	262.4
Foundry equipment new orders index (shipments, 1947-49=100)	85.9	57.6	127.0

* Seasonally adjusted N.A. Not available

Another Tinnerman Original...

Self-retaining "U" and "J" SPEED NUTS® cut assembly costs up to 50% or more!

If you are worried about rising assembly costs, let one-piece "U" and "J" SPEED NUTS keep costs down... and improve your product.

They can't fall off, once they've been pressed into screw-receiving position. No welding, staking or other secondary fastening devices needed. You eliminate lock washers – spring steel SPEED NUTS are self-locking, make vibration-proof attachments.

SPEED NUTS are ideal for blind assembly or hard-to-reach locations. Apply them *before* you paint panels without danger of paint-clogging. Or *after* porcelainizing, without damage to finishes. The "U" type is similar to the "J" type, shown above, but is used where full bearing surface on the lower leg is required.

A free Fastening Analysis can tell where SPEED NUT brand fasteners belong on your products. Call your Tinnerman representative – he's listed in most major telephone directories. Or write to:

TINNERMAN PRODUCTS, INC.
Dept. 12 • P. O. Box 6688 • Cleveland 1, Ohio

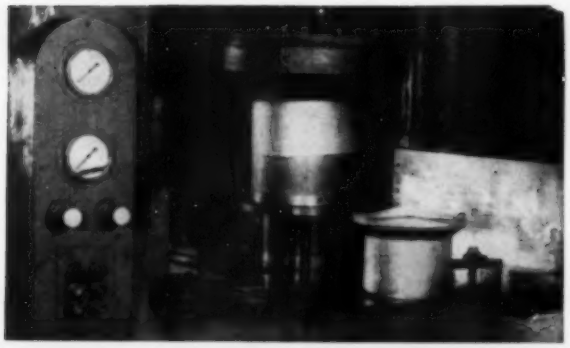
TINNERMAN

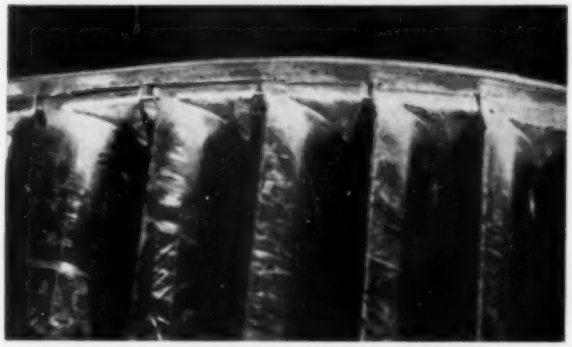
Speed Nuts®

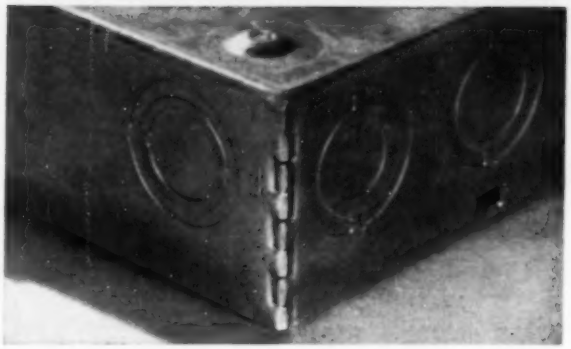
FASTEST THING IN FASTENINGS®

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S. A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Nocam-Bundy GmbH, Heidelberg.

Draw, Form, Interlock or Pierce Armco ZINCGRIP Steel— Its Special Zinc coating stays on







Workable zinc-coated Armco steel offers opportunities to cut production costs, add sales points to your products.

More than 22 years' experience in metalworking shops has proved that Armco ZINCGRIP® can be worked to the limits of the base metal without flaking or peeling of the special hot-dip zinc coating.

Cuts Production Costs

The ductile, adherent coating on ZINCGRIP means you don't have to baby it in the shop. In sheets or coils, it can be fabricated readily on modern high speed production equipment. And mill-coated ZINCGRIP often makes it possible to eliminate costly painting or plating operations on parts that must be protected from rust.

Adds Sales Points

Besides cutting costs, products made of ZINCGRIP have a smooth, attractive appearance that gives them sales appeal and economical corrosion resistance that keeps customers satisfied.

Let us send you more information on how the multiple advantages of Armco ZINCGRIP Steel can help you give your products an edge on competition. Just fill out and mail the coupon.

New steels are born at Armco

ARMCO STEEL CORPORATION, 2348 Curtis St., Middletown, Ohio

Send me information on Armco ZINCGRIP Steel. We manufacture_____

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COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Never a Better Time

Most metalworking managements are sitting and looking and listening. They are postponing buying decisions to what they think will be a better day. No one knows when that day will come.

We believe that they should give careful consideration to abandoning this do-nothing policy. We are convinced that there is a powerful case for purchasing new cost-saving equipment now instead of later.

For one thing, now is the time to get ready for tomorrow. Metalworking business, like all of industry, is currently in the doldrums. This slackness gives management plenty of time to examine carefully all the production machines in its shop, to weigh the practical aspects of replacing the older, less efficient ones with more modern, more profitable units.

Men responsible for . . .

manufacture have more time than in years to look at new machines now being offered and to see them in action. Many of the production officials are taking full advantage of this opportunity.

There is another side to this matter. Machine builders are in a position to give the best service in years. They are in a buyer's market for sure. The buyer is king.

The builder's entire staff is not as busy as usual. His sales engineers, and those of machine tool distributors, have ample time to spend in trying to help prospective buyers figure out the best way in which to do jobs, with the best tooling setups.

There is little or no standing in line waiting for deliveries. Machinery builders are not beset from all sides by impatient customers demanding that their machines be delivered day before yesterday.

The buyer has the field to himself. He is in a spot to obtain superb service, getting the kind of attention that is virtually impossible when business is really good. This attention extends from the sales engineer who solicits and gets the order, to the builder's engineering department, to the builder's shop organization that produces the machines, to the builder's service men who install the machines and teach the customer's operators how to run them.

It is like being in . . .

a good restaurant with only several other customers. The restaurant staff has the time to shower attention on you. They want to see that your every wish is fullfilled. The waiters hover over you. Because he is not rushed, the chef takes extra pains to prepare your food just right. The service is prompt.

Every alert metalworking management should make the most of this "fair and warm" climate in which to do business. This ideal weather is not going to last forever. It could change faster than you think.

There is another compelling reason for acting without delay. Metalworking business is taking a breather now. But indications are that it will be of relatively short duration, after which a higher operating rates will be resumed.

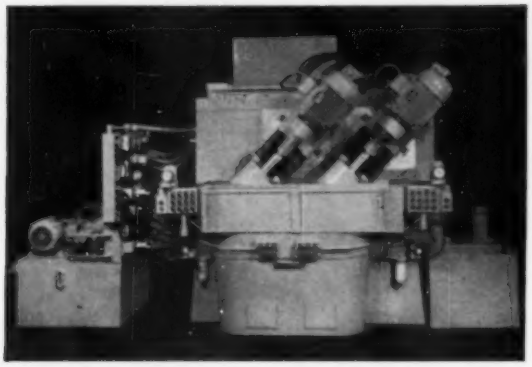
Never will there be . . .

a better time than today to get ready for tomorrow—to put shop production equipment in tip-top shape, to replace the obsolete with the up-to-date, to be set for low-cost, high-volume production when demand turns up. Otherwise tomorrow will be upon you before you know it and you will be caught unprepared.

Burnham Finney EDITOR

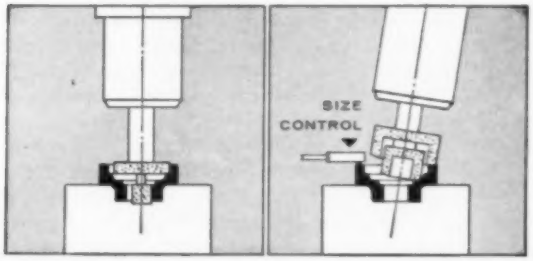
Vertical grinding reduces setups

SPRINGFIELD



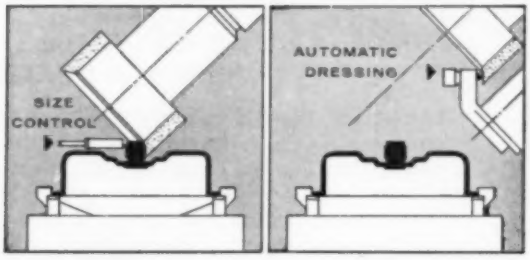
One head grinds while the other retracts for dressing, unloading and loading.

The double spindle Springfield vertical grinder in the photo is typical of vertical grinders automotive production men are using to 1) reduce setups, 2) improve grinding productivity, and 3) save floor space.



Transmission sun gear, 4 surfaces ground in 2 operations.

Two double spindle vertical grinders grind 330 gears per hour. Size control and wheel dressing are accomplished automatically. Typical machine cycle shown below.



Transmission housing hub, 1.-form grinding with automatic size control; 2.-spindle retracted for automatic dressing while operator unloads machine.

When part requirements change, only dresser, fixtures and sizing devices change—the machine itself has a long production life because heads can be repositioned easily.

Springfield special vertical grinders, with any desired degree of automation, pay for themselves in two years or less on long runs; standard Springfield vertical grinders pay off rapidly in large toolrooms and job shops.

We'd like to discuss with you the principle of vertical grinding, vertical contour grinding, and subsequent cost savings. Please send today for illustrated Bulletin 197-B. The Springfield Machine Tool Company, Springfield, O.

NEWS REPORT...

Demand Mounts for Two-point Program To Stimulate Purchase of Capital Goods

Legislation permitting faster write-offs of capital goods, both as a temporary and permanent stimulus to the nation's economy, has been given wide support throughout the metalworking industries, an American Machinist check shows. The belief is strong that such action would spur expenditures for plant and equipment, particularly for modernization of existing factories.

Proposed Congressional action centers around a two-point program advocated by AMERICAN MACHINIST in its May 19 issue:

First—**Congress should pass legislation allowing purchasers of capital goods within the period between July 1, 1958, and December 30, 1959, to depreciate their entire new investment within five years.**

Second—**Congress should authorize use of the "bracket method" of writing off investments in capital goods, with the average depreciable lives for production equipment put in the five-to-ten year bracket.**

Senator Ralph Flanders of Vermont has written that **"I am supporting the accelerated depreciation bill in the Senate and believe it can be usefully altered in the direction called for in your American Machinist editorial."**

Senator Lyndon B Johnson of Texas, Democratic leader of the Senate, states that he will "certainly give close study to these proposals."

The National Tool and Die Manufacturers' Association, representing 1100 contract tool and die companies, has endorsed the AMERICAN MACHINIST program for accelerated depreciation. President Philip R Marsilius of the association spoke recently before Congressmen and other key government officials at a Washington meeting. He says that "as a recession measure to stimulate the capital goods industry and at the same time to recognize economic obsolescence by providing for shorter useful lives of machine tools, it would be opportune to incorporate this two-point program in a tax revision bill."

National Machine Tool Builders' Association already has gone on record in favor of a two-point depreciation program exactly similar to the AMERICAN MACHINIST proposal except that the effective dates for the five-year writeoffs would be from January 1, 1958, to June 30, 1959. AMERICAN MACHINIST program suggests the 18-month period begin July 1, 1958, and extend to December 31, 1959.

Timken's Views

A strong plea for such a program was made by Wm E Umstattd, president, The Timken Roller Bearing Co in a special statement to AMERICAN MACHINIST:

One of the surest ways to make America a strong nation would be to have a reappraisal of the depreciation allowance system now in effect. American industry could be made strong and ready for defense if depreciation allowances could be taken more quickly. Today with the inflationary trend we have experienced since the end of World War II it is impossible to purchase machinery in sufficient quantity to keep our economy strong.

If machinery could be depreciated in one, two, or three years it would mean that Management could exercise its judgment in regard to taking the depreciation at the time most favorable for Company operations. The one thing that politicians and the tax experts in government seem to overlook is the fact that depreciation can be taken only once. If our plants could be brought up to date by the purchase of new machinery and we could avail ourselves of all the technological advances that have taken place, the American industrial machine would be able to produce things needed for the economy in peace or in war.

"My belief is that fully 50% of the equipment now being used in American industry is obsolete. It could be replaced with newer and better machines which would make cheaper and better products in greater quantities if a more realistic approach to the depreciation problem would be taken by the legislators and the administration in Washington."

Small Business Need

A suggested change in the program to meet the needs of small business is effectively suggested by R O Laughlin, co-owner, Marshall Mfg Co, Marshall, Mich, in a letter to AMERICAN MACHINIST.

"Your two-point program is a good one, but it only touches the larger well-heeled companies that can afford new equipment. Yet, it does not give one spark of help for those of us who purchase all of our new equipment from used equipment dealers.

"Of the many manufacturing concerns in our town of approximately 6,000 people, only our company has maintained full employment including overtime hours for our employees. Marshall Mfg Company is a co-partnership; and in our year ending December 31, 1957 we earned a net profit after salaries of slightly more than $12,000.00 on which we had to pay taxes in excess of $3,600. Unfortunately, this tax levy was so heavy that in expanding our volume of business and adding "new" old machines to meet the growing demands for our service and products, we were forced to borrow money to meet taxes.

"We feel that Congress should go further than just your two-point program and include allowances for income tax purposes to buy "new" old machines and effect some building improvement and/or production techniques. An effective and equitable basis on which to make this tax allowance would be on volume of sales for manufacturing concerns whose volume of business doesn't exceed $1,000,000 and/or not to exceed a deduction of $10,000.

"Thus, point three would give stimulus to the small producer to improve his facilities; and, thereafter, the Treasury would reap profits of ten, twenty, even thirty fold because of increased productivity.

"Perhaps such an initial allowance would be too much of a strain on the Treasury. If so, the program could be a gradual one taking place over a five-year period. Maximum allowance for the first year: $1,000; second year: $2,000; third year: $4,000; fourth year: $7,000: fifth year: $10,000.

"This plan is so simple that it has probably escaped the minds of the great economic and political thinkers of our present era."

Hydraulic Forum Stresses System Control

DETROIT—Ways and means to improve hydraulic products, system designs, and maintenance methods were subjects of open forum discussion among machine tool builders and users, hydraulic accessory suppliers, and representatives of technical schools and colleges here May 27 and 28. The occasion was the third Production Machine Tool Hydraulic Forum sponsored by Vickers, Inc.

Here are some of the topics and the highlights of the discussions:

• **Fluid motors**—the most efficient fluid motor is the piston type, with the gear type next. The vane-type fluid motor is the least efficient (about 74% over-all efficiency at 1600 rpm) because of higher leakage. A Vickers' representative made mention of a new valve to control flow rate capacity. Such a valve would permit rapid traverse rate at less than full pump capacity.

• **Circuits and systems**—Considerable interest was shown in various ways of mounting manifolds and hydraulic components on machine tools. The "Christmas-tree" approach, where a number of valves are placed directly on the machine, was criticized becaulse of maintenance problems. Mounting the valves on panels and placing the panels near the machine is preferred because it simplifies maintenance, makes for easy identification, and eliminates the stresses imposed on the machine as well as on the hydraulic components.

• **Erratic feeds** — Discussion on causes and cures for erratic or "jumping" feeds on machines actuated by hydraulic cylinders pinpointed the presence of air in hydraulic lines as the main cause. Easily vented air cylinders can solve this problem. Next check for improper slide lubrication, and then for loose mechanical connections.

• **Slow feed rate control**—This was the topic of a paper presented by G Hyland, hydraulic engineer with Sundstrand Machine Tool Co. He pointed out several prerequisites for optimum hydraulic system performance: minimizing internal system leakage, maintaining control of the oil metering out of the force device, selecting the proper valves and components, and minimizing friction of sliding members.

• **Electrohydraulic servo valves**—A user's viewpoint on electrohydraulic servo valves and hydraulic motors was presented by R K Sedgwick, assistant chief engineer, Kearney & Trecker Corp. He suggested several future design improvements: more rugged valves, more standardization in electrical connections, and interchangeability among different makes and types of servos.

Moderators spark discussions . . . at Third Production Machine Tool Conference sponsored by Vickers, Inc. At left is G R Cypher, plant manager, Kokomo Torque-Flite plant, Chrysler Corp and at the right is Kurt Tech, engineering vice-president, The Cross Co

Taxes, tariffs and trouble . . . were the subjects covered by the keynote speaker, A V Bodine, president of The Bodine Corp and president of NMTBA

Metalworking . . . . . . today, tomorrow and the future . . . was the subject of a dinner talk by Burnham Finney, editor of *American Machinist*

Realistic Depreciation

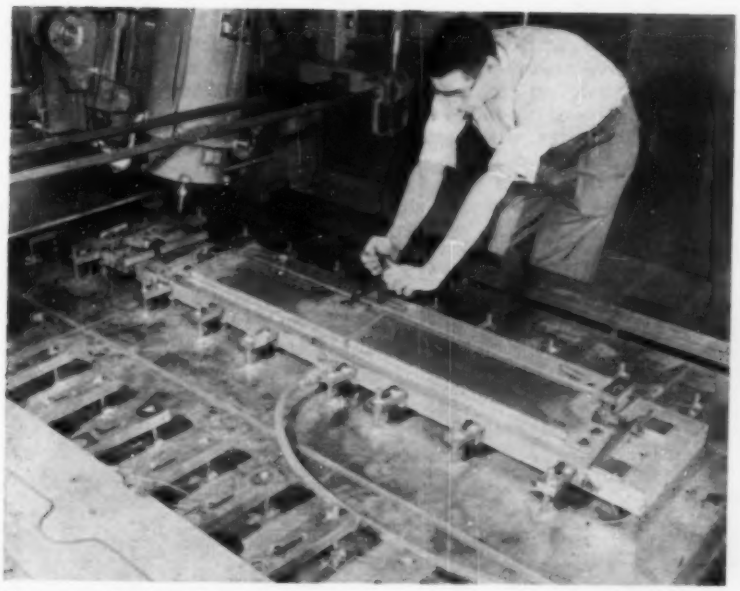
Highlighting the forum were talks by the keynote speaker, A V Bodine, president of the Bodine Corp and president of the National Machine Tool Builders Association, and by the dinner guest speaker, Burnham Finney, editor of *American Machinist*.

Speaking of the current recession, Mr Bodine said that by replacing obsolete machine tools, companies could reduce costs and thereby offer their customer more or better products for their money—a sure way to increase sales. Need for replacement was never greater, he said, and added that hesitation to do so is only prolonging the recession. A more realistic depreciation policy on the part of the Treasury Dept is what is needed, said Mr Bodine, who then outlined the recommendations made to the Treasury by the NMTBA.

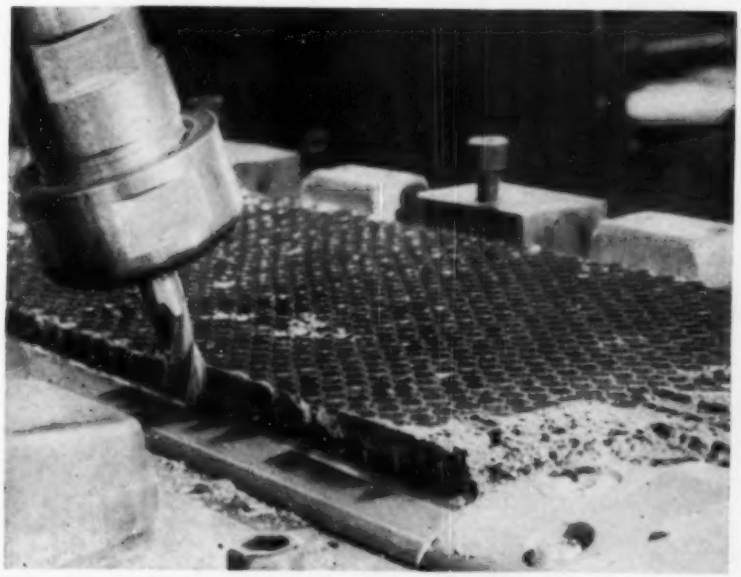
Slice and Electrogrind Honeycomb for B-52 panels

WILLIAM G KOEHLER,
supt of metal bonding,
AERONCA MFG CORP,
MIDDLETOWN, OHIO

Aluminum cores are shaped with circular milling cutters, stainless-steel cores are electrolytically ground; both by latest methods and equipment to make full-contact-bonded sandwich structures



Vacuum chuck is bolted down . . .
to support 45- and 100-in. honeycomb rudder and elevator cores for B-52 bombers. Setup is on model AHT-72 Onsrud gantry miller specially designed for honeycomb cutting. Machine has a liquid-cooled five-speed motor integral with the spindle (left), and can automatically follow overlay templets with a hydraulic tracer. Vacuum line draws 26 in. of mercury



Foamed adhesive that joins edge strips and fittings . . .
to honeycomb is cut away with HSS end mills because the adhesive is highly abrasive and would damage circular cutters. Some curved forms along side strips may also be machined with form-ground ¾-in. end mills

Strong bonded joints between honeycomb skins and cores can only be attained after the cores are machined accurately for full core-end contact with the skins. The most successful method of building honeycomb panels, such as B-52 rudder and elevator tabs, works this way:

1. Bond one side of the core to a flat "false skin" of aluminum that can be removed later.
2. Machine the opposite side of the core with the false skin on its back, held by a vacuum chuck.
3. Bond a contoured skin to the machined face of the core.
4. Strip away the false skin.
5. Machine the exposed core surface to a flat or contoured form, holding the assembly by vacuum chuck.
6. Bond the second contoured skin into position.

This produces a core solidly bonded to the skin on both sides, with no unfilled voids between (which would seriously reduce panel strength).

MILLING CUTTERS

Tests at Aeronca with several kinds of tools proved that a "valve-stem" cutter without serrations of any kind will do the best job, cutting honeycomb core to flat or contoured shape without leaving flashed or burred edges that would produce voids in the assembly. Cuts as deep as ½ in. are made in roughing; fin-

Slice and electrogrind honeycomb . . .

ishing takes off only 0.09 to 0.100 in. at a feed rate of 15-20 ipm. Stock is usually of strips 0.001 in. thick.

Although tests were made with a No. 5 Cincinnati vertical miller and a Rockford openside planer fitted with a high-speed Bridgeport head, production runs are now made on a special Onsrud gantry miller with tracer controls. This has a 6x15-ft table with enough space for four vacuum chucks that hold cores, or for large aluminum sheets that are routed with traced controls from overlay templets. Cams on the cross-rail control spindle tilt to a maximum of 20°, and adjust vertical cutter position; spindle speeds range from 500 to 14,400 rpm.

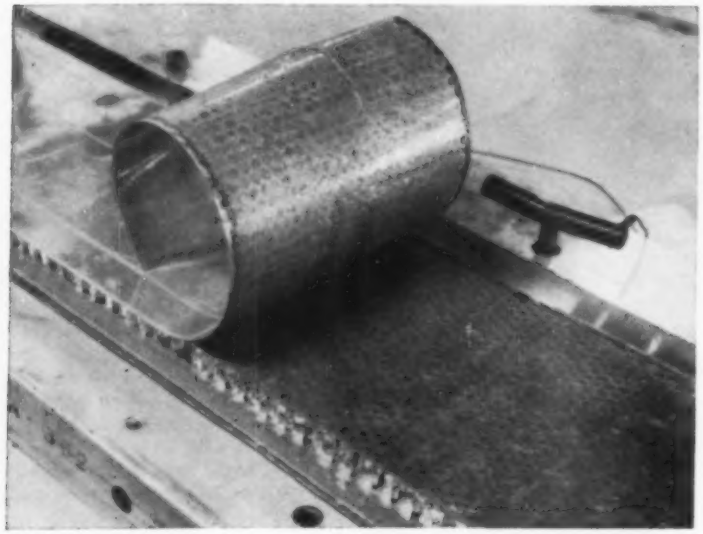
ELECTROLYTIC MACHINING

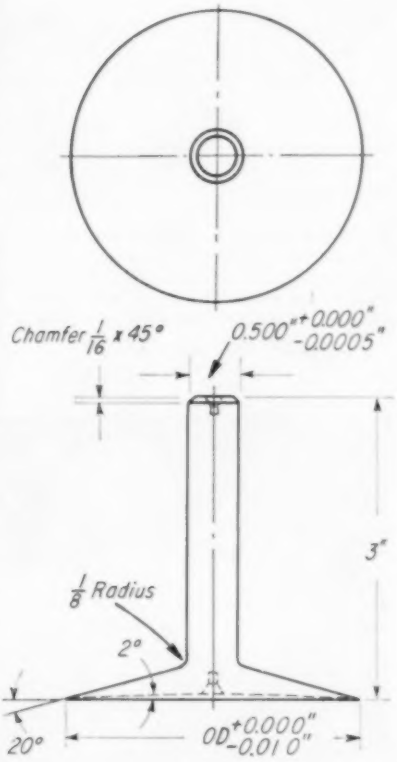
Stainless-steel cores are more difficult to machine, and they are now being cut with a modified Anocut electrolytic unit on a Rockford planer. Cores are mounted on a 43x72-in. flat platen with internal piping, and are clamped with Cerromatrix alloy, which is heated by steam and cooled by water running through the platen. This arrangement replaces the vacuum chuck used for aluminum cores. However, there is a tiltable vacuum chuck at one end of the table for test setups.

Cutting speed with the 300-amp power pack is 20 ipm when the grinding wheel takes a cut 2 in. wide and 0.020 in. deep. Core flatness is within ± 0.003 in. tir.

Stainless honeycomb cores 0.310 in. high, 15 in. wide, and 39 in. long are roughed on one face in 5-10 min, and are finished in about 30 min with a slower feed on the final pass. Stock is usually ribbons from 0.001 to 0.005 in. thick. See also "How to Make Sandwich" (*AM*—Mar 25 '57, p137).

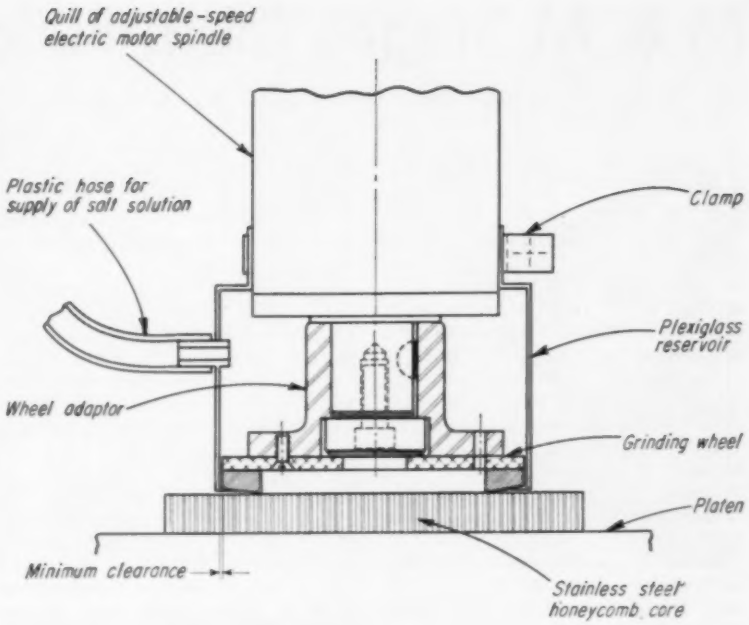
"Valve-stem" disk cutter . . .
roughs and finishes honeycomb at 7200 rpm, taking a pass of half its width or less. Tool is HSS, hardened to 63 R_c, and ground all over. Edge is shaped to 20°, with 2° undercut on face so tool will not burnish the work. Face and circular runout must be under 0.002 in. tir. Sizes range from ½ to 6 in. (cutter shown has 2-in. OD). Cutters with Stellite-faced edges are currently being tested

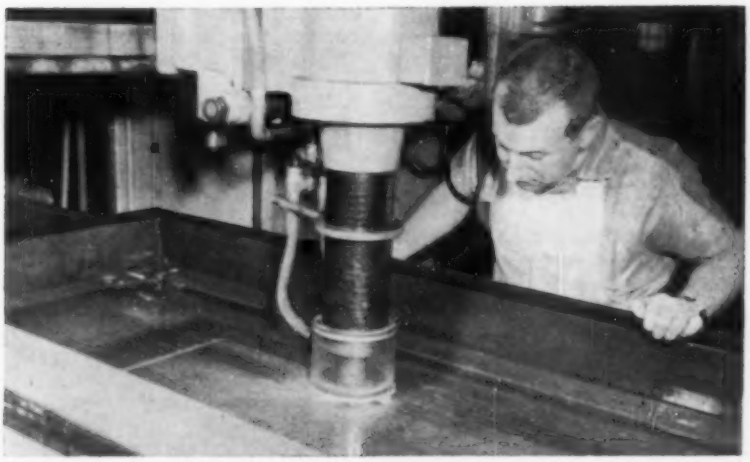




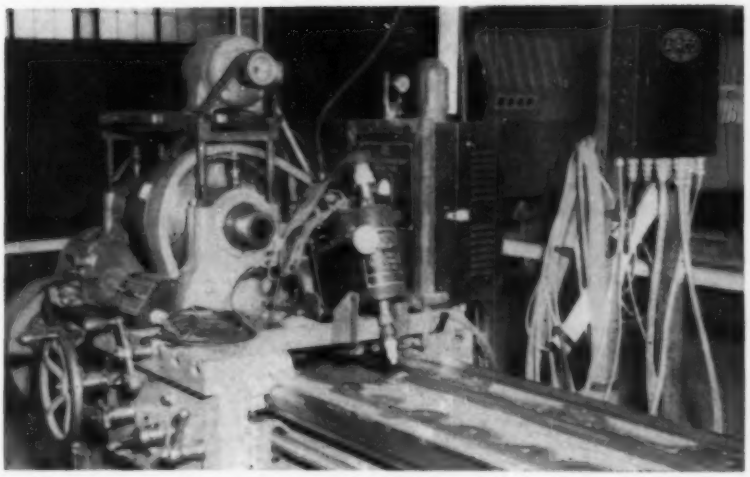
False skin is stripped away . . .
from core after shaped skin has been attached to other side. Quality of bonded joint can be seen in the hex pattern on the skin. Assembly is held on vacuum chuck to prevent distortion while skin is stripped. Remaining adhesive must be machined away, then top skin can be added

Extensive laboratory and shop tests show that the best honeycomb-bonding adhesives — the formulas that provide the strongest joints between honeycomb edges and flat skin sheets—will not fill cavities if any of the honeycomb sections are damaged. Thus burrs, tears, and bends cannot be allowed, and machining must be done to close tolerances. Results are worth the time and trouble; panel weights have been cut as much as 60% with honeycomb, and rivets and stiffeners can be eliminated. Thinner skins can be applied, and aerodynamic surfaces can be made smoother to reduce aircraft drag.





Stainless-steel core is machined . . .
with electrolytic setup, where 5-hp Standard Electric "isolated-spindle" grinder head operates on Rockford hydraulic openside planer. Plastic shield surrounds the 6-in. metal-bonded diamond wheel to control flow of salt solution. A 300-amp Anocut unit connects between the spindle and the table to provide electrolytic power. This produces cuts without burrs to an accuracy of 0.003 in. tir



Trailing edges of elevator tabs are welded . . .
to join the two skin sheets where honeycomb tapers out. Heliarc head is inclined at 18° toward direction of travel, which lengthens puddle and allows good welding without burning the thin sheet metal. Welding speed is 33 ipm, fast enough to avoid burning and slow enough for good joint

M & M Stages Multi-Builder Show

CLEVELAND—A dramatic anti-recession move was made here when nearly $1 million of the latest machine tools were exhibited at the Euclid plant of Motch & Merryweather Machinery Co (expanded facilities described in *AM*—May 5, p 112). The special show, sponsored by this firm, ran from June 3 through June 7 and attracted over 3000 metalworking executives and production men who watched power demonstrations of 60 machines built by 19 companies represented by Motch & Merryweather. Products of 14 other manufacturers represented by M & M were also exhibited and included machine-tool accessories, inspection equipment, and cutting tools.

Motch & Merryweather also demonstrated machines developed by its own Manufacturing Division. These included a 2-spindle vertical turning machine; a single-end milling and centering machine; a new inline milling and centering machine with two milling and two drilling heads for machining automotive crankshafts; and a heavy-duty upright drilling and boring machine. Another was an automatic cycle drilling machine, produced by its Avey Division. Punched steel tape provides automatic positioning of a universal table on this machine for duplication of work positioning in either short or long-run jobs.

Gears Hardened Under Water

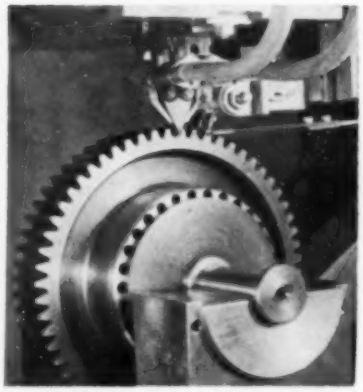
One of the most interesting new exhibits was a "Cold Heat" gear-tooth induction-hardening machine shown by Gould & Eberhardt, Inc, licensed to manufacture it by Delapena & Son, Ltd, Cheltenham, England. With this unit, precision gears can be shaved and then hardened with virtually no distortion of tooth profile so that subsequent grinding is eliminated. A contour-ground induction coil is inserted between two teeth and heating takes place in a tank of water into which the work is submerged. This prevents heat distribution anywhere except at the profiles of the teeth being heated. Upon completion of one heating and quenching cycle, gear is automatically indexed to the next tooth form. Depth of case can be controlled within 0.001 in.

New Surface Grinder

Of special interest was a Norton 6 x 18 surface grinder with 125-fpm table speed. With this table speed, better grinding action is obtained because there is more cutting and less rubbing. This reduces surface damage to parts—especially those made of heat-sensitive steels. This firm also exhibited an automatic combination radial and face truing device mounted on top of a grinding wheel head. The device provides perfect blending of face and radial surfaces on a wheel by means of the constant speed of its diamond point relative to the wheel contour. Consistent wheel wear and longer diamond life result.

Programmed Turret Lathe

Considerable attention was given an Oster No. 3 turret lathe with a programming drum that controlled turret and cross-slide functions as well as collet chuck and spindle speed selection. Kaukauna Machine & Foundry Div of G & L also demonstrated a new turret lathe, this one a vertical machine with RH swiveling turret head, LH ram type rail head, RH side head, and 4-jaw combination chuck, and constant-cutting-speed attachment.



Less than 0.0002 in. distortion . . . on the profile of gears of about 8 DP is achieved with this Gould & Eberhardt—Delapena gear tooth induction hardening machine.

$38.3-Billion Defense Appropriation Bill Stresses Hard-Goods Procurement

WASHINGTON—A $38.3 billion Defense Department appropriation for the year beginning July 1, with a heavy accent on hard goods procurement, has gone through the Democratic-controlled House of Representatives and may, if anything, be liberalized by the Senate. The bill will permit Pentagon to make obligations of $41.6 billion the next fiscal year. Of that amount, about $37.4 billion is likely to be spent, according to best estimates (there is always a lag between appropriation, programming, obligating and actual spending).

Features of the bill are:

- Allotment of $782 million for "the most modern and mobile equipment and weapons possible" for the Army for its Pentomic Divisions for atomic warfare.
- Army is asked to restudy its vehicle concepts. "Many vehicles it proposes to purchase, such as the M-141 quarter-ton truck and the mighty mite, represent at best modications of obsolescent design."
- Navy's submarine missile program gets $944.8 million, of which $682 million is for eight more missile-carrying subs. Shipbuilding and conversion program calls for $2 billion. Another $597 million is ear-marked for Navy ordnance and ammunition procurement.
- $10 billion is set aside for aircraft buying and modification, including guided missiles and component parts.
- Air Force gets $6.3 billion, including funds for 982 planes (among which will be 39 B-52s and 26 KC-135 tankers). Most emphasis will be on high-performance jet fighters and fighter bombers.
- Navy is given $1.9 billion for, among other things, 697 planes but funds may be used for only one of two new Navy all-weather fighters—McDonnell's F4H-1 and Chance-Vought's F8U3.
- Army's $1.6 billion includes $130 million for initial sets of equipment for the Nike Zeus anti-missile system, and $98 million for 420 planes. Missiles include Hawk and Nike-Hercules (anti-aircraft), Redstone and Sergeant (surface-to-surface), Dart (anti-tank, going in production for the first time), and Lacrosse (for close ground troop support).

Soldering irons supply heat for studies of corrosion resistance in heat transfer. Bank of tests is connected to automatic recording thermometer and feed-back unit that maintains established temperature for each test

Field conditions are accurately simulated for...

Better corrosion-resistance studies

READING, Penna—Tomato juice, sauerkraut juice, mustard, acids, chemicals, and ordinary water are among the many corrosive media whose effects on steel alloys are being studied at the Corrosion Research Laboratory recently opened here by The Carpenter Steel Co.

The continuing goal at the Lab is to set up tests that will more accurately represent field conditions and therefore permit better forecasts of the ways alloys will behave in service. An example of the ingenuity applied to this task is seen in the test above where conventional, 550-watt soldering irons have been converted into accurately controlled sources of heat.

Each iron is heating a metal specimen about the size of a silver dollar. The top side of the specimen is fastened to an opening in the flask above and exposed to a specific corrodent.

The test is more accurate than standard boiling tests, because edge effects are eliminated, and because the heat is actually being transferred through the metal as it would be in a heat exchanger, a common application for alloy tubing.

Another technique developed in the Lab gives faster, more accurate results from the standard ASTM boiling nitric acid test. The multi-sample tester is continually supplied with pure, clean acid, so as many as 36 samples can be exposed at the same time. Ordinarily, the corrosion products in the acid would accelerate the corrosion and distort the test results.

Stress corrosion cracking, still one of the mysteries of stainless steel, is also being studied carefully in an effort to learn just how this type of failure comes about.

These and other studies in the new Lab are expected to lead toward better application of existing materials and development of new and improved corrosion-resistant steel alloys.

Many samples are tested . . . at same time in new procedure for boiling nitric acid test. Distillation system keeps acid pure, improves quality of results

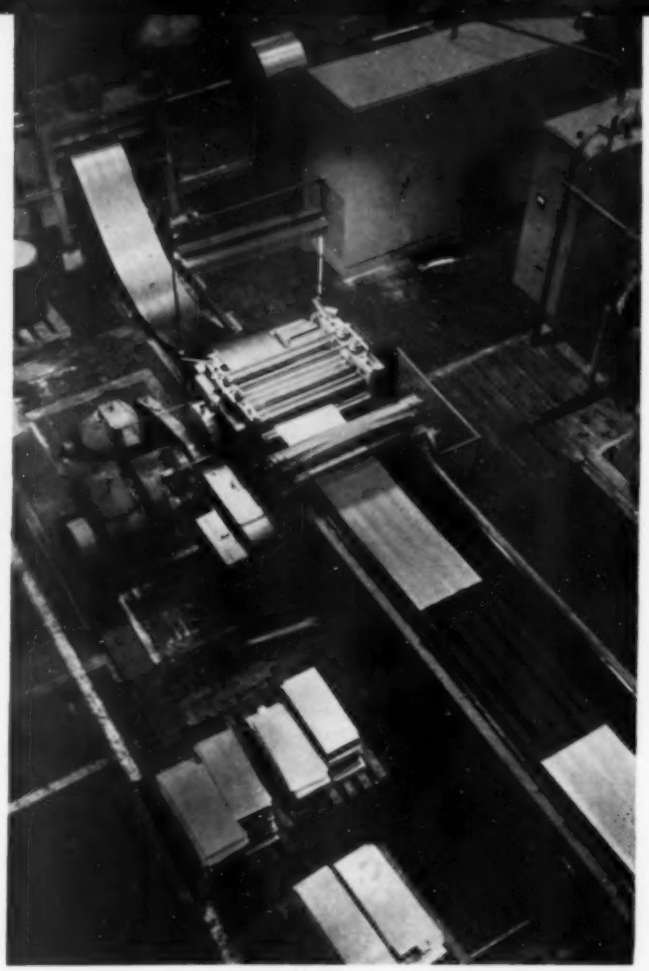
Series of samples is loaded . . . with different applied stresses and placed in accelerated corrosion medium for studies of stress corrosion cracking

Three Cost Cutters in

press stock
wire welding
plastics molding

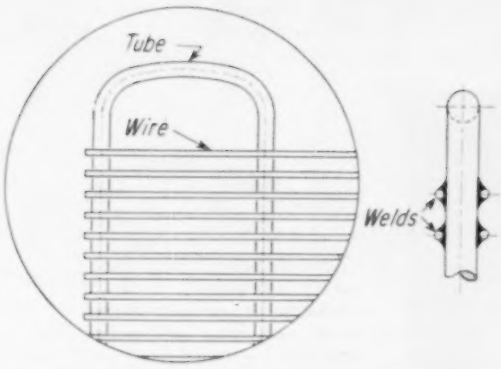
Here are some outstanding space-, time-, and money-saving ideas passed on to you by Clifford Heaton and Marvin Avery of Westinghouse Appliance Division, Columbus, O.

- Coil stock has been applied twice as much in the last year to save on material and storage costs
- Tube-and-*wire* refrigerator condensers replace tube-and-sheet units to save plant space and to operate more efficiently
- Plastic door liners are extruded and vacuum-molded instead of injection molded at a tooling cost of only $12,000, against $40,000.

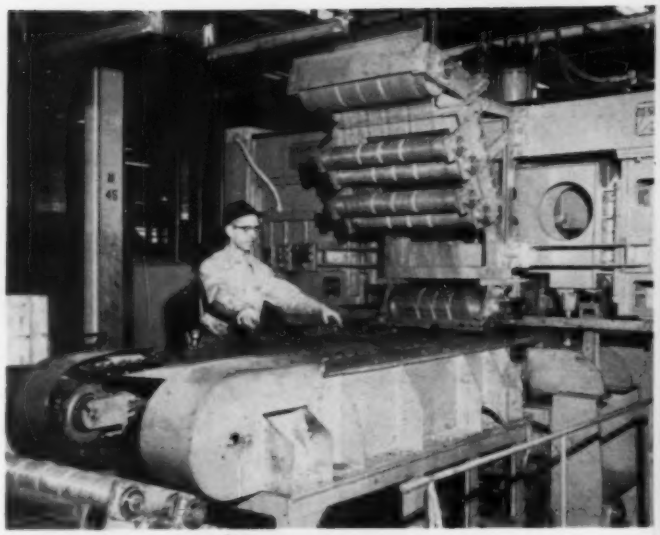


Coil stock costs less and takes less floor space . . .
Refrigerator panels are started at Halldon reciprocating shear, which holds tolerance of ± 3/64 in. on 164-in. lengths while stock runs at 200 fpm. Photocell counts blanks, which are marked to identify supplier. Roller conveyor carries blanks to roller leveler (out of picture, lower right). System will handle 0.078-in. stock 48 in. wide, and is controlled by trimmer rheostat wired to Westinghouse motor-generator dc supply

Fast slitting saves storage space and material costs . . .
Dishwasher side panels, cabinet stiffeners, and mullion channels are cut to width from 0.125-in. crs 48 in. wide at 570 fpm. Uncoiler is at right, slitter in middle, and coiler at left. Seven 1½-in.-wide pieces, one 11-in.-wide, and one 9-in.-wide are slit, saving about $6 per ton over mill-stock cost

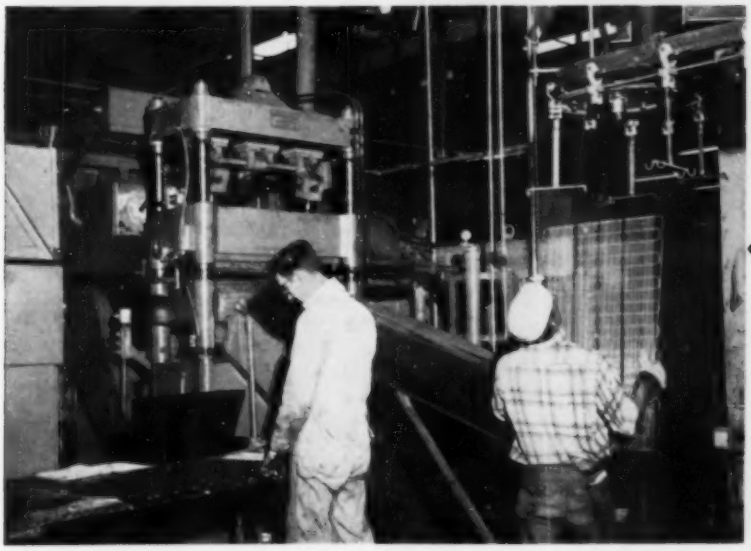


Tube-and-wire refrigerator evaporators . . . exchange heat more efficiently than tube-and-sheet assemblies, and take 40% less manufacturing space. Evaporators are 22 in. wide and 22-42 in. long, with tubes bent on 2-in. centers



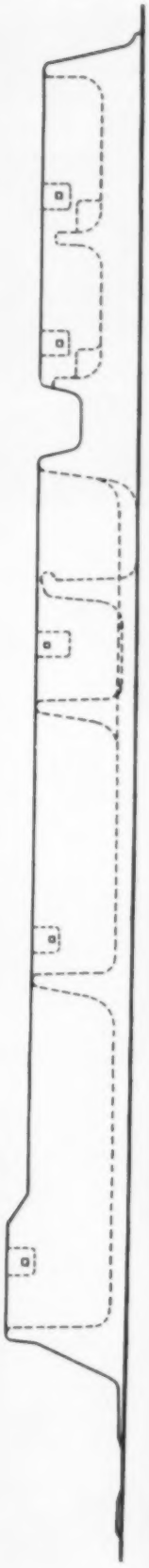
Cypak-controlled Resistance Welder assembly machine . . . joins wire (from overhead grooved rollers) to tubes (loaded into nests on table chain conveyor). Conveyor feed is synchronized with welding cycle at 40 strokes/min. Machine welds wires to both sides of tube, shears the wire, and ejects assemblies at 180/hr

Wire feeds to assembly welder . . . (rear) from 148 reels, each in a barrel on the floor. Guides and pulleys overhead uncoil and line up the wire to feed in parallel into the machine. Stock is C-1008, 0.062 in. in dia



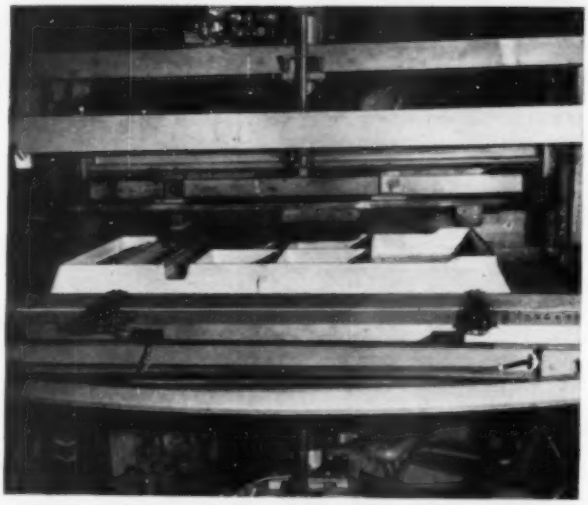
Evaporators are separated by HSS shuttle tool . . . that cuts both rows of wire on back-and-forth stroke. Tube end is bent 90° and protective rubber cap is added, then evaporators are loaded onto assembly conveyor

Three cost cutters . . .

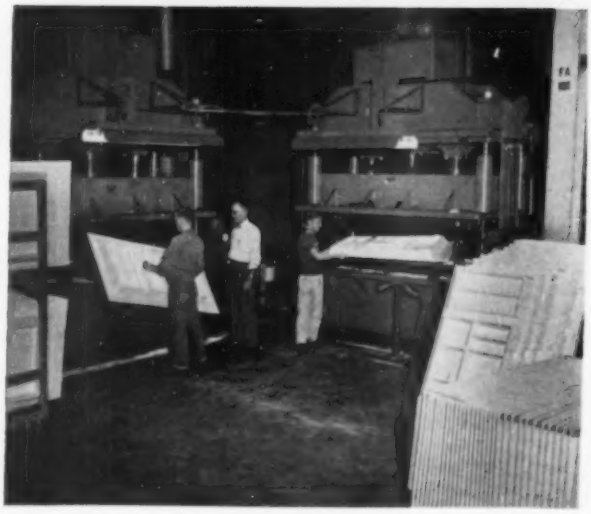


Plastic door liners for refrigerators are extruded . . . then vacuum molded to save $28,000 on molds and 75% on molding machines. Vacuum molding allows more frequent style changes and quicker changeover for colors. Scrap can be salvaged 100%; not possible with injection-molded panels, as before. Polystyrene sheet is extruded to 0.115-in. ±0.003 thickness (to allow accurate heating later) by National Rubber Co machine at 350 lb/hr

Three-station rotary machine vacuum-forms door liners . . . Air cylinders clamp sheet in front, then two banks (above and below) of Chromalox infra-red heaters soften sheet at left. Upper bank heats top surface most for high finish. Eagle reset timer allows control over heating, forming, and cooling cycles. Machine was built by Brown Machine Co



Wooden "plug assists" at forming station . . . push hot sheet into mold as hydraulic cylinder lifts table. The vacuum is pulled through mold holes to complete forming. Two fans go on to cool the work. All machine motions and functions are automatic after operator pushes initiation button at front station



Two Hannifin 100-ton presses pierce mounting holes . . . and trim flanges to fit door seals. Parts are trucked away on Dexion "erector-set" movable racks to assembly area

AGMA's New President
E F Borisch
Executive Vice President
Milwaukee Gear Co

VP, Gear Products Div
John L Buehler
President
Indiana Gear Works, Inc

VP, Technical Div
Folke Richardz
Consulting Specialist
Westinghouse Elec Corp

Treasurer
J F Murray
President
Winsmith, Inc

Lessons Learned in In-plant Gear Education

HOT SPRINGS, VA—"In-plant" education of young employees in gear engineering has taught Giddings & Lewis several things about such programs:

- **Purpose of the program must be carefully explained.**
- **Incentives do not have to be invented.**
- **Entrance examinations may be necessary.**
- **A certain percentage of students will always leave on completion of the course.**
- **Failure in a specialized course should not be held against a man for other assignments with different requirements.**

These points were brought out by Paul J Leeser in a report on the program run for the last nine years at the G & L and Hypro Div of Giddings and Lewis to develop gear engineers. Eleven courses have been given with 4 to 14 students per course.

Unless the point is driven home repeatedly that the course in itself is without much value unless the student applies the things he has learned in later years, the student is likely to gain the impression that successful completion will entitle him to a fancy title and a considerable raise in salary.

With proper explanation, such incentives do not have to be invented because the fact of selection and limitation of the number makes for keen competition among applicants.

High school records of grades in mathematics have proved disappointings as a measure of a man's ability to absorb the material in a gear mathematics course.

There have been cases in which men who received special training either at "in-plant" or "away-from-the-plant" programs have been strongly tempted by recruiting programs of other companies. But more often than not, according to Mr Leeser, the employee who can be talked into changing his allegiance under these circumstances would sooner or later leave anyway.

When a man does decide to leave, it is usually best to let him go without a fight. Bribing him to stay is likely to start an expensive chain reaction.

The report on G & L's gear education program was one of the highlights of the 42nd annual meeting of the American Gear Manufacturers Association held here June 1 to 4. Debate over reorganization of AGMA dominated the opening sessions, but by the close of the meeting, most of the disagreements were on the way to settlement.

Organization of AGMA

AGMA is now organized into two divisions: technical and product. The technical division will deal with the many standardization matters that have come to be such a large part of AGMA's operations. The product division will deal with marketing, statistical, and other management problems of the various product groups.

Previously both types of work had been handled within the same committees, causing some confusion in the sessions. Separating the two groups is expected to make it easier for each committee to concentrate on its own primary problems.

Connell Award

Winner of the 1958 Edward P Connell Award is Darle W Dudley, section head of the development section, Gear Engineering Div, General Electric Co. Darle Dudley is the youngest man ever to win the Connell Award. In addition to his active work in AGMA, he is the author of "Practical Gear Design" (McGraw-Hill: 1954) and is now writing a manual of gear engineering.

Gear-train Accuracy

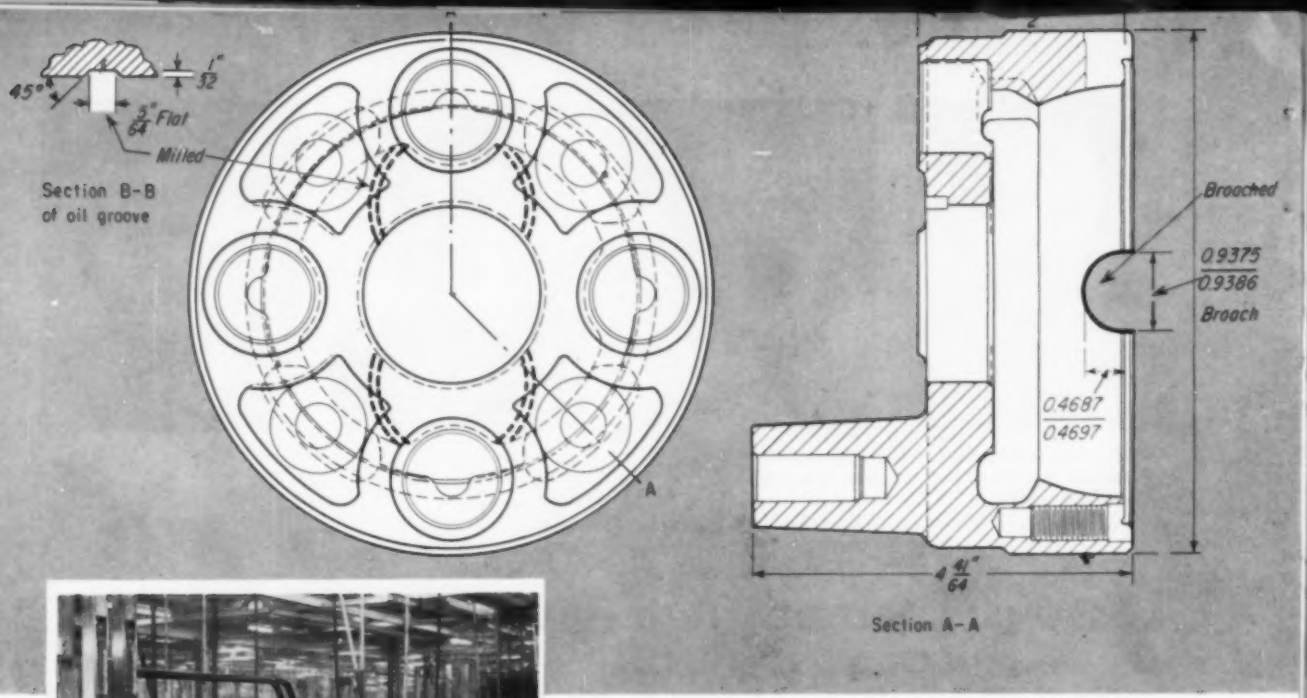
Work in measuring angular accuracy of spur gears under no-load conditions was reported by Ferdinand Freudenstein of Bell Telephone Laboratories. Angular error is the difference between the theoretically correct angular position of a gear in a gear train and the actual position.

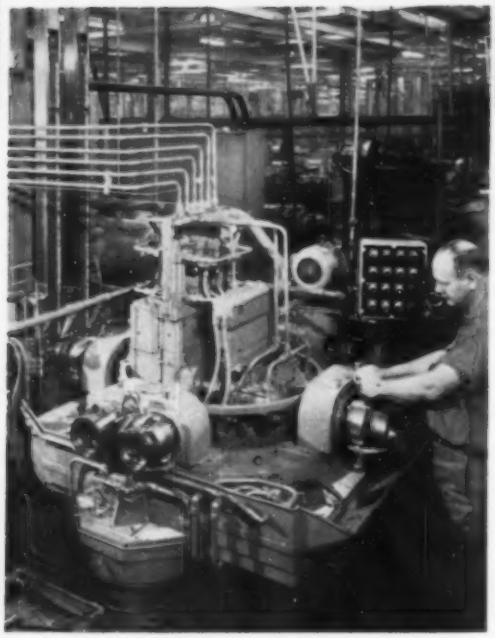
Main sources of error, in order of importance, are eccentricity, lateral runout (wobble), profile error, tooth thickness variation, and pitch error. Equations were developed for calculation of the effect of these various errors, representing conservative first approximations, according to Mr Freudenstein.

To improve gear train performance based on studies to date, will require:

- Reduction of eccentricity tolerance from 0.001 in. per inch pitch diameter to about 0.0001 in. per in. PD.
- Close specification of lateral runout (perhaps 0.001 in. per in. PD).
- Use of hobs with a larger number of flutes.
- Specification and control of permissible slope error in profile test.

Attendance at this meeting, the first held under the new bylaws adopted May 15, was about 10% higher than last year.





Differential cases are broached and milled . . .
in pairs on rotary 4-station machine. Parts (left-hand and right-hand) are loaded, idle through one station, are broached to produce half-round notches at left rear, and are hollow-milled (right-hand case only) to produce oil grooves at right rear. Heavy wash of soluble coolant flushes chips to May-Fran chip conveyor

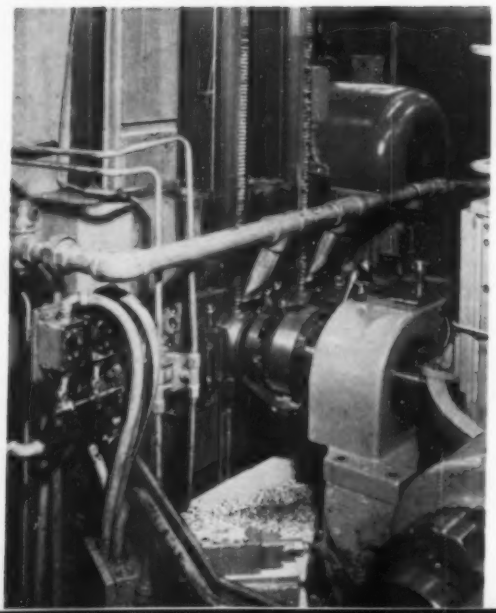
Eaton saves 70% with combined broaching, milling

GEORGE H DE GROAT, Detroit editor

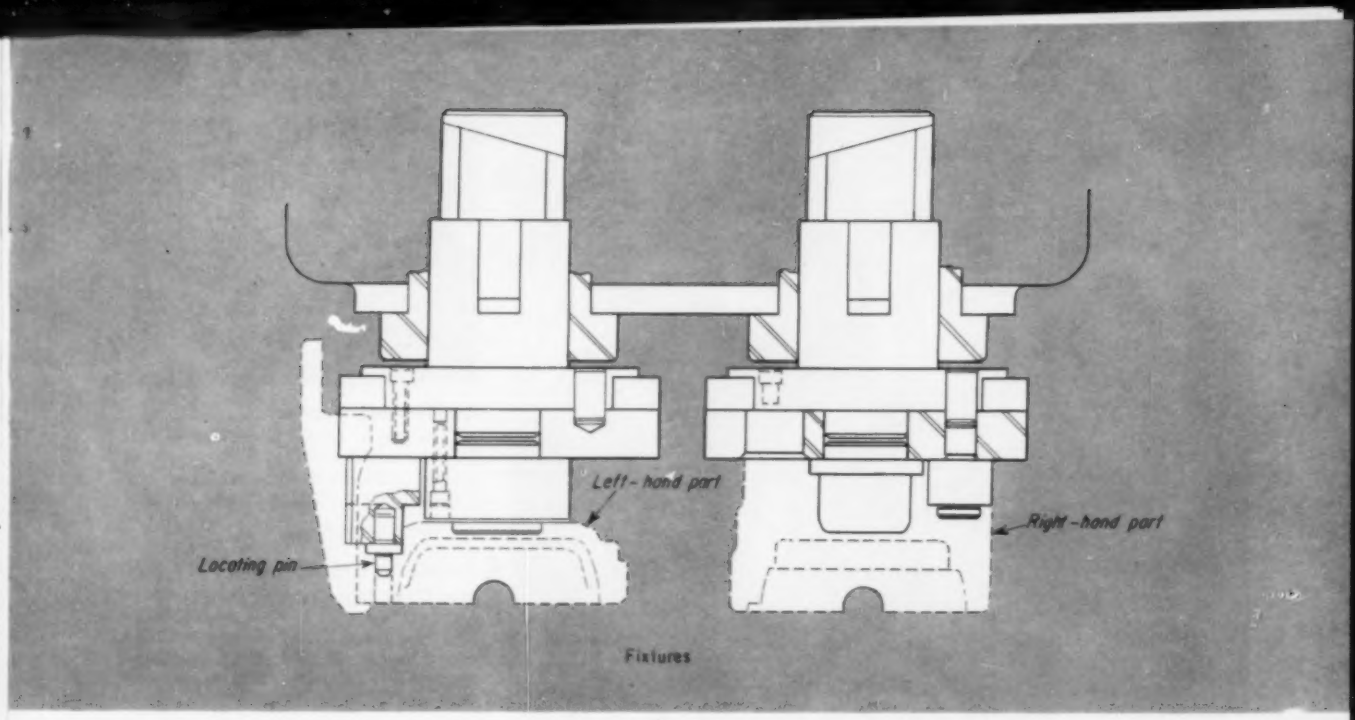
- **70% less machine time**
- **Reduced setup time**
- **Practically no rejects**
- **Less maintenance**
- **Less floor space**
- **Reduced operator fatigue**
- **Less materials handling**
- **Unbalanced inventory eliminated**

These were the results after Eaton Mfg Co, Cleveland (Axle div), worked with American Broach & Machine Co (div of Sundstrand Machine Tool Co, Ann Arbor) to develop a machine that combined milling and broaching.

Reason for the new machine was a study that showed



Broaching cutters on 60-in. ram . . .
are sectional HSS elements. Roughing sections produce square cuts, but round semi-finishing and finishing sections may be indexed as they wear. Setup rigidity has increased tool life over older method with separate machines for left- and right-hand cases



Mating pairs of cases . . .
are lightly clamped at American Broach-Sundstrand special machine solely to hold them as the table indexes. Pins locate parts by drilled holes so broach cuts will be made in the right places. Parts are moved forward toward broaches by hydraulic ram

broaching capacity was too low to meet production demands. Originally, mating automotive differential cases were routed to two broaching machines where half-round spider slots were cut. This took 96 sec. In addition, internal oil grooves had to be milled, taking an additional 30 sec on separate machines.

The new method combines all the broaching with half the milling in a 38-sec cycle for two parts, which are machined to better quality standards. The malleable CI stock is machined to 0.001-in. total tolerance in a hydraulically operated machine.

The rotary indexing table has four stations, one for loading and unloading, second idle, third for broaching, fourth for milling. Parts are moved forward at third station for first broaching cut, then retracted, indexed 90°, then moved forward for another cut. A solenoid-operated locating pin catches the first grooves to locate for the second set.

Topological geometry —key to metal structures?

Simplified models used to show the structures of powder metal parts, as well as crystal structures, molecular arrangement, etc, are too unrealistic as compared with actual structural conditions. Because of the limitations of Euclidean geometry, this simplicity can lead to misinterpretations of activities during structural change and development. Powder particles, for instance, rarely have any precise regularity of size or form and they are almost never stacked in any simple arrangement; rather, size and form tend to be irregular and tumbled together in random fashion. This is true of most structures.

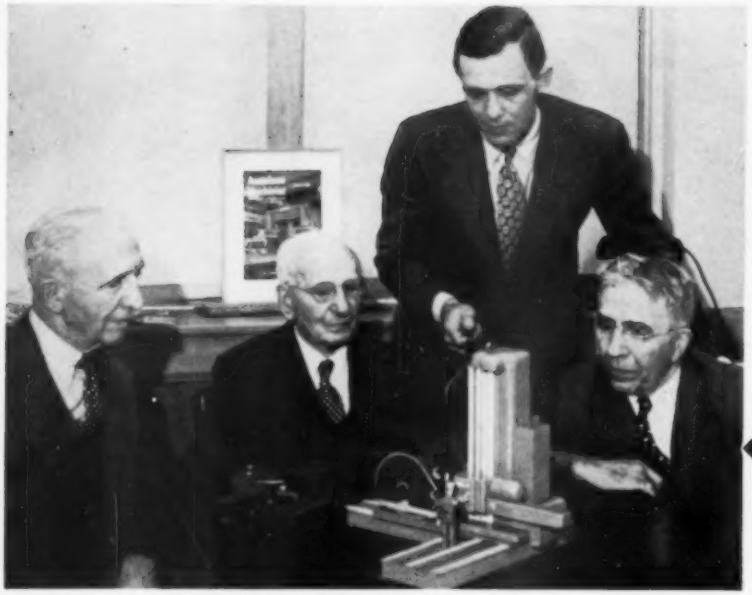
Professor F N Rhines, Alcoa Professor of Light Metals, Carnegie Inst. of Technology, Pittsburgh, feels that topological geometry is a far more reliable descriptive method.

In a paper read at the Fourteenth Annual Meeting of the Metal Powder Association the professor pointed out that this calls for the form of topological geometry which deals with closed surfaces. It is not concerned with the metric properties of such surfaces; nor with lineal dimension area, contained volume or even difference in direction.

Topological surfaces are considered to be unaffected by deformation —as long as they are neither cut nor joined. The one property retained by such a surface is *number*. The number of surfaces in a mass of loose powder, for example, is equal to the number of particles.

Every simple, closed surface is topologically equivalent to a sphere, and is described in this geometry as "Genus O." Surfaces of a plate, a rod, a bowl, and a rudimentary four-legged table can each be stretched into spherical form without cutting or joining hence are topologically equivalent to each other. A teacup, because of its handle, would require one cut before it could be formed into a sphere. It is classed as "Genus 1." Genus is determined by the number of bonds which must be severed to return the surface to "Genus O."

While this paper was written by Professor Rhines to present "A New Viewpoint on Sintering," the ideas may have much broader metallurgical application.



Outstanding member . . .
Henry Marx (left) receiving certificate commemorating his 68 years of ASME membership, presented by James Todd, ASME president, in 1948

Examining a scale model . . .
of a Gray machine are, seated left to right, Erwin Marx, vice president of G A Gray Co, Henry Marx, chairman of the board, August Marx, president. Standing is Graham Marx, vice president and general manager

Henry Marx celebrates 100th birthday

Henry Marx, chairman of the board of the G A Gray Co, Cincinnati, will celebrate his 100th birthday on June 22. He has been actively associated with the company since he became general sales manager in 1889. He served as president from 1905 to 1952, when he assumed the responsibilities of board chairman.

Together with Thomas Edison, Ambrose Swasey, and a small group of other engineers, Mr Marx helped to found the American Society of Mechanical Engineers in 1880 (the founding meeting of the ASME was held in the New York offices of the *American Machinist*). In 1951 the Society presented him with a certificate stating that he had been a member longer than anyone else; and in 1955 he was awarded a medal in recognition of his 75 years of membership.

A native of Toledo, Ohio, he attended Toledo public schools and then studied four years at the Realgymnasium at Karlsruhe, Germany. In 1879 he graduated in mechanical engineering from Cornell University and for three years worked in various metalworking shops. He joined Hill Clarke & Co as a traveling salesman in 1882 and, when manager of its St Louis branch, seven years later began his 69 years of association with the G A Gray Co.

Under the leadership of "Mr Henry," as the Gray employees call him, the Gray company outgrew its shop in Cincinnati and moved to a new location which eventually was too small. In 1926 the company moved to its present site where the plant has been enlarged and further modernized four times.

Mr Marx illustrates the changes that have occurred in the machine tool industry during his lifetime by recalling how one of his jobs with the Gleason Works in the early days was to lay out accurate divisions for a dividing head. On the floor of a large, empty loft building the largest possible circle was described. The circumference of the circle then was divided as accurately as possible into the requisite number of parts. The radii from the center to the division points on the large circle made extremely accurate (for those days) divisions of the dividing head plate.

Triple Industrial Supply Convention . . .

Sponsored by the American Supply & Machinery Manufacturers' Association, National Industrial Distributors' Association, and Southern Industrial Distributors' Association, this year's meeting was held at New York's Waldorf-Astoria Hotel May 26-28. Newly elected officers of the American Supply & Machinery Manufacturers' Association are (left to right) Clare Payne, Safety Socket Screw Co, Chicago, secretary; Lyman H Bellows, Sheldon Machine Co, Chicago, president; Paul A Johnson, Jr, Dake Corp, Grand Haven, Mich, treasurer; Samuel D Conant, Jacobs Mfg Co, West Hartford, Conn, second vice president. Fred C Emerson, Spartan Saw Works, Springfield, Mass, named first vice president, was not present when the picture was taken.

Brazing makes strong assemblies out of paper-thin parts

AMIEL GELB, director of laboratories, and
GEORGE E KORB, industrial engineer,
South Wind Div,
STEWART-WARNER CORP,
INDIANAPOLIS, IND

Aircraft heat exchangers must be light, strong, and pressure-tight. Light-gage stainless steel parts are carefully assembled and then oven brazed to satisfy the requirements

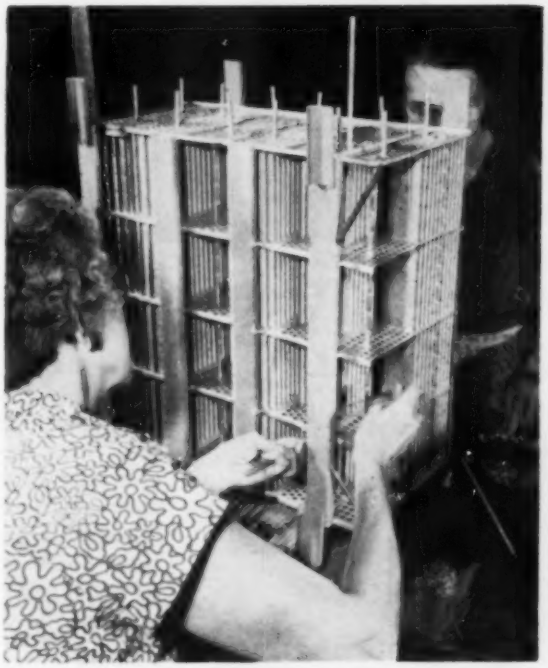
Wherever a tube passes through a spacing plate in these high-efficiency heat-exchanger cores, the joint must be brazed to provide the required strength. As the units are destined for aircraft applications, they must also be as light as possible. Therefore, both the tubes and the spacing plates are made of light-gage, stabilized stainless steel.

Great care is exercised at Stewart-Warner's South Wind Div to make sure no joints are missed. Then, after another operator flares the tube ends, the cores go to a special, 125-kw Lindberg electric furnace with automatic cycle controls.

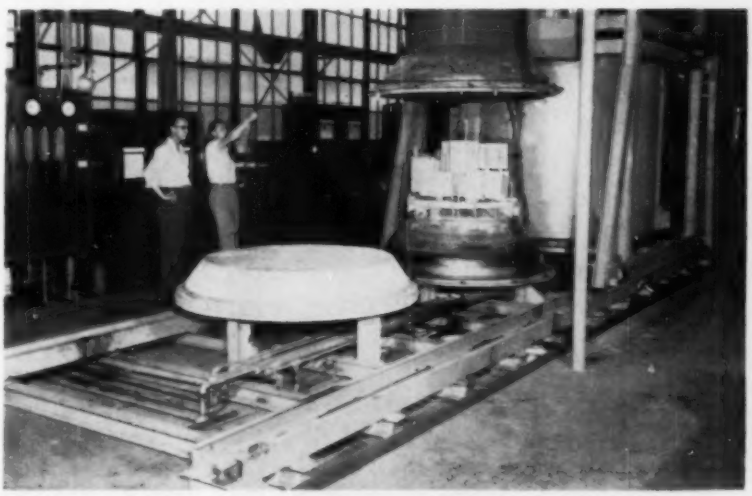
Here, they are placed under one of the air-tight inner bells in which hydrogen or dissociated ammonia provide a reducing atmosphere. Then the electric furnace itself is moved into position along its track and lowered. The space between the bell and the hood of the furnace is filled with an inert-gas atmosphere to reduce oxidation and lengthen the life of heating elements and bells.

After brazing temperature is reached (usually around 2050 F), the load is allowed to cool almost to room temperature, where the reducing gas is purged from inside the bell before it is removed. In all, the thermal cycle lasts about 4 hr.

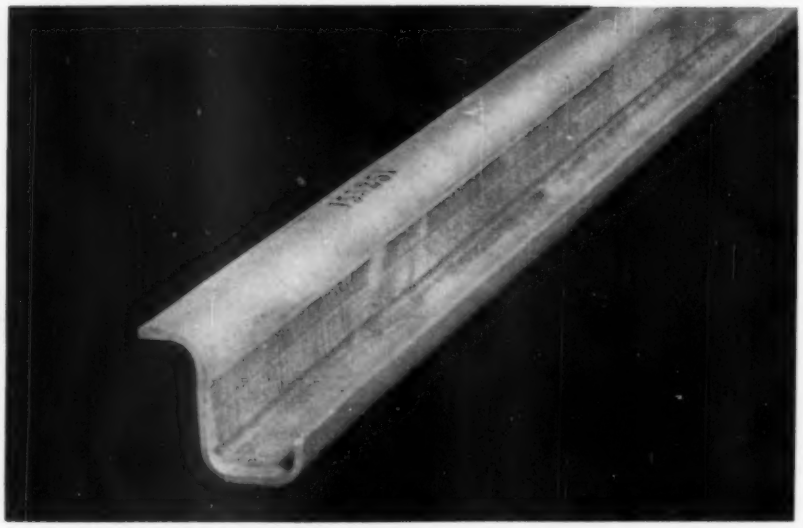
In the furnace area there are two heating stations. A third station conserves the heat in the furnace when it is idle. The furnace is raised and lowered and shuttled from one position to another by its own gantry bridge, and the bells are moved by overhead hoist.



Assemblers prepare thousands of braze joints . . .
while building heat-exchanger core. Rings of brazing alloy are positioned at most joints, straight alloy wires or mesh at others



Three-position layout speeds brazing operation . . .
Here, heat-exchanger cores are positioned under center bell while furnace heats a batch of parts in rear position. Idle position (front) holds heat in furnace or bell when not in use



Severe bends in structural parts . . .
can now be formed almost completely by machine, eliminating up to 70% of the hand forming required before. Rejects due to breaks are practically eliminated

Sub-Zero Quench

Precipitation age hardening can be licked by keeping heat-treated aluminum alloys under zero F during forging, bending, and stretching operations. Douglas Aircraft uses special refrigerated tanks filled with a mixture of Stoddard solvent and trichlorethylene, dips the parts to drop them to –40 F, then forms aircraft shapes without danger of cracking

R J DELANEY, supervisor, sheet-metal shop,
DOUGLAS AIRCRAFT CO, EL SEGUNDO, CALIF

Heat-treated aluminum alloys are most ductile—and therefore most easily formed—immediately after they have been quenched from solution heat. However, many of these alloys will age harden at room temperature in only an hour or two. Storage under conventional refrigeration fails to prevent hardening, and the result has been excessive breakage during forming operations, or the addition of many manual operations to complete a partly formed workpiece.

An extensive investigation was made to find a cooling method that would keep the parts below zero through the forming operations. The cooling bath had to remain fluid in the sub-zero range, have minimum toxicity, and not react with aluminum. A combination of Stoddard solvent and trichlorethylene, with carbon dioxide as the coolant, was found most suitable.

TWO-STEP QUENCH

Parts are heat-treated, then dipped in refrigerated water at 40 F for about 30 sec. Then they are plunged into the sub-zero solution, which is maintained at –40 F. Parts remain in this tank for 5-30 min, depending on size and shape. When the parts are actually formed, their temperature rises to no more than zero F.

Microstructure is unchanged with this cold treatment, but greater elongation is obtained. Ductility is high. In one case, 70% of the hand forming formerly

Long aircraft parts are dipped . . .
in sub-zero solution after conventional heat-treating and quenching. Tank liquid is mixture of Stoddard solvent and trichlorethylene, cooled by dry-ice blocks down to –40 F

Parts may heat up to zero . . .
but no more, by the time they are actually formed. This stretch-formed piece has a sharp leading-edge contour that flows into shape much easier when part is cold-treated

Tames Formed Aluminum

necessary was eliminated, saving about 463 hr/wk. Part breakage has been eliminated when long, tapered Z-sections are formed for horizontal aircraft stabilizers. Cold-treating has eliminated scrap on stretch-formed parts with sharp leading edges. And two secondary planishing operations were eliminated in drop-hammer forming; malleability of the cold-treated alloy reduced wrinkling.

Spar caps are now checked and straightened in about 7 hr, 4 hr less than required before. Altogether, an estimated 24,000 labor hours were saved in a year, in addition to improvements in work quality.

MACHINING AND WELDING, TOO

The technique has also improved results when titanium, aluminum, and steel are machined. Aluminum forgings, for example, can be machined without distortion, where the same parts without cold-treatment were serious problems.

Surface finish, tool life, and production rates were improved in milling 4340 steel forgings on a Cincinnati Hydromatic. Sub-zero solution is directed to the point of contact between work and cutter. A centrifugal pump directs the fluid, which is at –40 to –50 F, and it flows down to an aluminum pan in the machine bed, then to the pump reservoir. Work is also immersed in the solution for 10-15 min, depending on size, to chill it before machining is started.

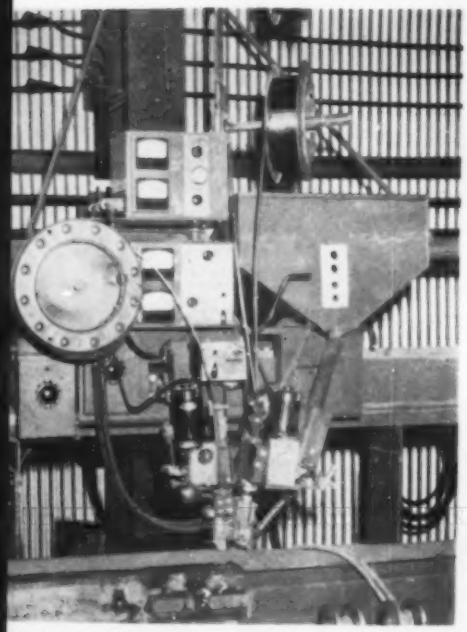
In this milling operation, chip load was increased from 0.003 to 0.020 in., feed rate from 0.750 to 5.0 ipm, and the production rate from 35 to 80 pc/day. Parts between regrinds jumped from 60 to 169.

Similar results have been gained in turning, routing, and other operations on many materials, including chrome-moly steel hardened to 270,000 psi (tensile), and also on thermosetting phenolic resins. Spotwelds, too, have been improved; work is chilled to –65 F, then spotwelded, then chilled again. Shear strength of welds in 0.040-in.-thick N-144 Multimet increased from 1700 to 2000 psi, and in 18-8 stainless from 1000 to 1300 psi.

Forgings are cycled three times . . .
from –100 to +212 F; the thermal shock eliminates all tendency toward distortion in later milling operations

Multiple arc multiplies welding speed

An automatic, multiple-arc welding setup travels at three times the speed of former single-arc method, and a new fixture helps turn out better parts with less handling



High-speed travel carriage . . . holds all welding equipment: electrode reels, welding and travel controls, flux hopper, and welding heads

One way to increase welding speed is to operate more than one arc at a time on the joint being welded. That's the technique adopted by Greenville Steel Car Co, Greenville, Penna. On the center sills for railroad cars, this manufacturer has attained speeds in excess of 65 ipm with multiple-arc welding—over three times the speed of the former single-arc setup.

At the same time, a new welding fixture with many original ideas has reduced the time required for setup and handling. The 75-ft fixture clamps the center-sill parts securely to a rigid frame. Then they are joined together as the welding heads pass over them longitudinally on a carriage that rides a fixed beam.

MULTIPLE ARC

Multiple-arc welding, or tandem-arc as it is sometimes called, employs two or more submerged-arc welding heads placed one behind the other. They are mounted close enough together so that the second, or trailing, arc operates into the still-molten crater of the leading arc. This results in unusually high deposition rates and correspondingly high welding speeds.

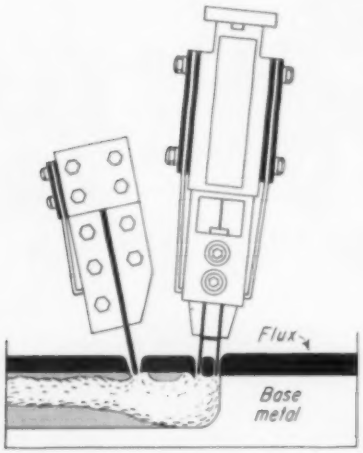
Each of the arcs has its own power source, usually DC for the leading arc and AC for the trailing arc, to minimize the magnetic interaction between the two. While DC is normally preferred for its smoother operation, if both arcs were DC, a severe arc blow condition might result.

A refinement of this basic arrangement replaces the single electrode wire in the leading arc with two smaller electrode wires, one behind the other, which feed one arc through a single Twinarc jaw. These two electrodes are controlled by one welding head. The advantage here is that the twin electrodes still further increase welding speed and may be skewed slightly to reduce penetration and improve bead shape when fitup is not tight.

On the center-sill installation at Greenville, both welding heads are standard, full-automatic, submerged-arc units made by Lincoln Electric. The leading head has a Twinarc attachment that handles two 3/32-in. electrodes spaced 3/8 in. apart. A motor-generator supplies DC power for typical settings of 1200 to 1300 amp at 34 v.

The trailing welding head is AC and uses a single 3/16-in. electrode wire. A typical setting is 1100 to 1200 amp at 38 to 40 v. A representative travel speed for the two heads working together is 65 to 70 ipm on 19/32-in. material.

The edges of the joint are not bevelled or otherwise specially prepared for welding. Standard, rolled Z-sections are used as they come from the mill. With normal mill tolerances, the fit-up is something less



Two heads feed three wires . . . Leading head (right) is DC and feeds two 3/32-in. electrodes through a Twinarc attachment. Trailing head is AC, has a single 3/16-in. electrode which deposits in the still-molten crater

Welder travels at 65 ipm . . . when joining Z-sections for railroad-car center sills. Hydraulic clamps hold parts; curved fixture prebends them to compensate for welding distortion

than perfect, even though the fixture holds the parts as close together as possible. However, the welding setup is flexible enough to take these variations in stride.

FIXTURE

The welding fixture fulfills several functions: It properly positions the work and clamps it securely to assure accurate finished dimensions; it prebends, or cambers, the sills during the operation to compensate for distortion caused by welding; it provides a flux backup; and it moves the welding heads over the work at the correct speed.

The bulk of the fixture is in its 75-ft bed and carriage beam. In the bed is a hollow, box-like beam that locates the parts and provides flux backup under the joint. A fire hose inside the box section is inflated under the flux and forces it tight against the joint after the Z-sections are in place.

The Z-sections are clamped toe-to-toe over the hollow beam. Various sizes of Z-section are called for, but the inside dimension is the same for all center sills, so the locating beam needs no adjustment. The heavy, hydraulic clamps are positioned to accommodate any Z-sections and still force them tight against the hollow beam and pull them down to conform to the curvature of the bed.

The curvature compensates for welding distortion by prebending the parts into a slightly convex curve from one end to the other. With this arrangement, it is unnecessary to straighten the center sills after welding. They are actually distorted *into* shape.

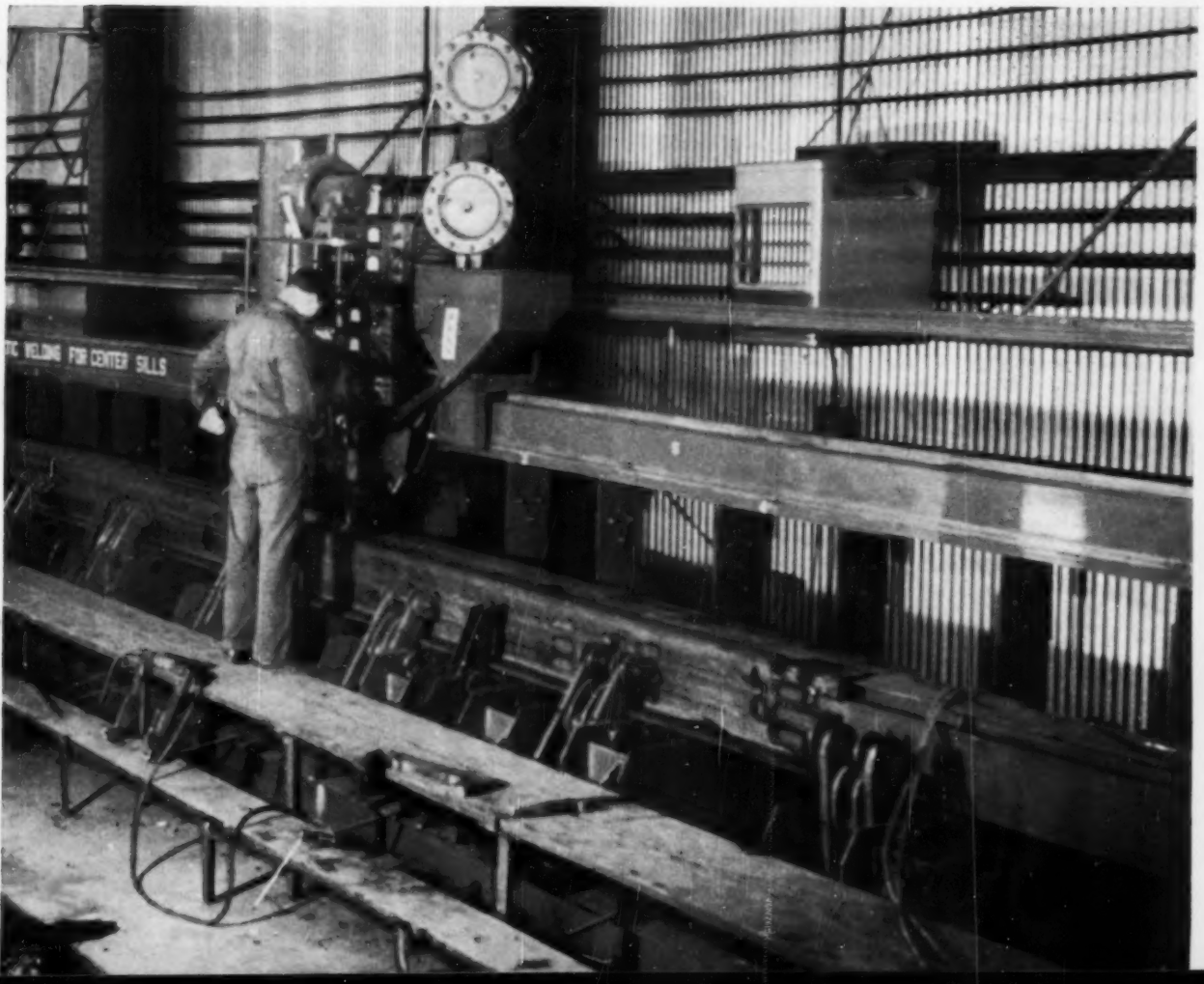
The travel-carriage beam has a similar curvature so the distance between heads and work does not change as the weld progresses. This minimizes the problems of flux control and electrode heating between the contact jaws and the arc. The amount of camber on both the bed and the carriage beam can be adjusted to compensate for different types of material, though this is seldom necessary.

All of the welding equipment is mounted on one travel carriage. The two welding heads and their associated controls, the three electrode reels, the travel-carriage speed control, and a large flux hopper all travel together. A flux-recovery system is mounted on a separate carriage which follows.

OPERATION SEQUENCE

The effectiveness of the design is evident in the ease with which the large center sills are welded. The operation begins when the Z-sections are put into position. They are lined up and then clamped. The fire hose is inflated to push the backup flux against the joint. The welding heads are positioned, and a guide light adjusted. Flux drops, the arcs start, and the travel carriage moves down the joint.

As the weld progresses, the operator moves with the carriage and, using the guide light, makes minor alignment adjustments to keep the weld centered on the joint. The flux recovery unit picks up the excess flux. After the weld is complete, the carriages are returned to the starting end, the clamps are released, and the sill is removed from the fixture.



LINEAR PROGRAMMING...

Tool for Small Business

STANLEY SPIEGELMAN, project engineer, Loewy-Hydropress Div,
BALDWIN-LIMA-HAMILTON CORP, NEW YORK, NY

Linear Programming is a planning tool that few small plants are taking advantage of at the moment. Far from being restricted to big business and the mysteries of Operations Research, it can be of immense help to the small company. The method described here reduces complex mathematics to simple arithmetic, pointing the way to maximum profits

Today intense competition and high operating costs are forcing small companies to seek new ways to improve profits. Linear programming, usually considered a big-business planning tool, can point out profit-making opportunities in the small company, too. If there are a limited number of variables and conditions in a problem, the small-plant manager can compute by hand the quantities of his products that he should manufacture for greatest profit.

What is "LP"? Linear programming is a mathematical means of dealing with the interaction of many variables that are subject to a set of limiting conditions. These variables must have a constant or linear relationship to the profit and to the limiting conditions; in most problems, such a relationship can be approximated. The solution—the so-called optimum program—will always, if followed in practice, result in maximum profit.

An important advantage of linear programming is that limiting conditions can be expressed as inequalities. Actually, inequalities frequently define a business or production situation more closely than do equations. For instance, when we speak of the production capacity of a machine, we imply a maximum quantity; but not every machine in a plant has to be operated at capacity in an optimum-production program. We can state this production capacity as a mathematical inequality: Optimum production can be less than or equal to capacity.

Here, then, are the earmarks of an LP program:

- Our solution will always be an optimum one.
- We can express the set of known limiting conditions as inequalities.
- We can include a large number of unknown variable quantities.

The optimum program is a yardstick against which past production records can be compared. The comparison will indicate whether the company has used equipment with maximum effectiveness, and reveal what products sales efforts should emphasize. Of equal significance, the optimum program can show how to allocate production time to each of the products a company makes.

LP IN THE SMALL PLANT

How can linear programming solve production problems in a small plant? What information does this method give? To answer these questions, let's see how LP can give an optimum production program in a small aluminum extrusion plant. (We might have chosen another type of plant—a screw-machine shop, or a plating shop, or a foundry. If there is a product mix, and if work has to be assigned to a number of machines or facilities, the same principles apply.)

The key facility in a typical small extrusion plant is an oil-hydraulic extrusion press of about 120-tons capacity. Typical products are architectural sections, window sections, furniture sections and tubing, and bar and rod stock. Here's the basic process flow: Billets are received and saw cut to length. They are then heated to extrusion temperature in an induction furnace coupled by a conveyor to the press. Now the billets are extruded; one operator at a central pulpit controls all loading, extruding, and die-changing operations. After extrusion, parts are stretched on a hydraulic stretching machine, then are inspected and saw-cut to finished lengths. Subsequently, the parts are heat-treated in an aging oven.

Production speed is governed chiefly by the machines. The extrusion press, the most expensive equip-

ment in the plant, must be able to produce rapidly a wide range of types and sizes of products. With several billet sizes, the company can make a variety of extrusion sections. A normal product mix may include a dozen extruded shapes, especially in a job shop.

The production rate at which each of the shapes can be extruded depends on the extrusion speed, which varies widely. Simple, symmetrical shapes can be extruded faster than complex ones. If surface quality of the products has to be high, speed must be reduced, for surface scoring is likely at high speeds. And other equipment besides the press may have different production rates: Stretching speed, for example, depends on the complexity of the extruded shape and the extent of warpage.

Suppose that the plant manager anticipates having 80 available hours of production time during a certain period. Let's further assume that he would like to limit his production during this period to three shapes. Moreover, as a complicating factor, he estimates that the aging oven will be out of service for 40 hours because of a planned overhaul. Under these conditions, *what quantity of each of the three products should be produced to obtain the greatest total profits from the manufacturing facilities?*

If the manager knew these quantities, he could concentrate efforts to sell this optimum program. At the very least, he would have an indication of how far he is deviating from the most profitable program if his plant accepts orders for other quantities.

Table A shows production data for the three products. This information includes production rates in pounds per hour for each facility, as well as the profits per pound of each product. (Note: These figures are contrived for the example and are not necessarily similar to what would be found in actual practice.)

STEP-BY-STEP SOLUTION

The solution consists of expressing all the conditions as equations, then solving these equations by a repetitive tabular procedure.

First, let x_1, x_2, and x_3 represent the pounds of products 1, 2, and 3 that should be produced by the plant's equipment to give maximum profit. This maximum profit can be expressed as $.03x_1 + .035x_2 + .04x_3$.

But the maximum profit must be obtained within limitations on the available hours of the equipment:

Press: $x_1\,(1/1400) + x_2\,(1/1200) + x_3\,(1/1000) \leqq 80$

Stretcher: $x_1\,(1/1400) + x_2\,(1/1100) + x_3\,(1/1400) \leqq 80$

Inspect-Saw: $x_1\,(1/1200) + x_2\,(1/1500) + x_3\,(1/1300) \leqq 80$

Aging Oven: $x_1\,(1/2000) + x_2\,(1/2500) + x_3\,(1/2500) \leqq 40$

All of the above four conditions, now inequalities, are next converted to *equations* by the addition of a "slack variable." The slack variable accounts for the difference, if any, in hours between available hours and the actual hours needed to obtain maximum profit. If the optimum solution gives a positive slack variable, it indicates that not all the available hours are required. A zero slack variable shows that all available hours have to be used for maximum profit.

If x_4, x_5, x_6, and x_7 represent slack variables for the four conditions, the above inequalities can be expressed as equations:

$$.000715x_1 + .000835x_2 + .001x_3 + x_4 = 80$$
$$.000715x_1 + .00091x_2 + .000715x_3 + x_5 = 80$$
$$.000835x_1 + .000666x_2 + .00077x_3 + x_6 = 80$$
$$.0005x_1 + .0004x_2 + .0004x_3 + x_7 = 40$$

The initial solution table, Table I, can now be prepared. Note that there are nine columns in Table I. The extreme left column, headed "Slack Variable," consists of the four slack variables in the same vertical order that the equations are written. The available hours corresponding to each of the equations are inserted in the second column. Production rates for the unknown (optimum) quantities of products x_1, x_2, and x_3 are inserted in the third, fourth, and fifth columns. (Solution tables are reproduced on p 112.)

The four right-hand columns are labeled "Slack-Variable Coefficient." The coefficient of each of the slack variables in the equations is equal to one. Therefore, a value of one is inserted at the intersection of every column and row labeled by the same slack variable; for example, a value of 1 is entered at the intersection of row x_4 and column x_4. A zero value is placed in other boxes of the slack-variable columns.

The profit per pound (or unit profit) associated with each of the three products is placed in row P near the bottom of the table. Values in the Z row, for which entries in Table I are always zero, are calculated in succeeding tables. To complete Table I, we compute the Z – P row by subtracting row P from row Z.

Successive tables now are computed in the following manner:

1. Choose the *most negative* of the numbers in the Z – P row. Here the most negative number is – .04, in the x_3 column. This locates the column that will replace a row in the next table.

2. Divide all numbers in the x_3 column that are greater than zero into the numbers in the same row of the x_H column. Find the *smallest quotient*, which in the example is 80 divided by .001, or 80,000. Because these figures in the x_4 row give the smallest quotient, we replace row x_4 in the second table with x_3.

3. The four rows in Table II are denoted as x_3, x_5, x_6, and x_7 in that order. Entries for the replacing row, x_3, are computed by dividing all values in the replaced row (x_4 of Table I) by .001. For example, to find the value in row x_3 under column x_1 in the new table, divide .000715 by .001, which equals .715.

4. To compute the new values of row x_5, let

V_a = any value in row x_5 of Table I

V_b = the value in replaced row x_4 of Table I that is in the same column as V_a

V_c = the value in replacing column x_3 of Table I that is in the same row as V_a

V_d = the value that is at the intersection of the replacing column and the replaced row in Table I (here, .001).

The formula for finding values for row x_5 in Table II is $V_a - V_b\,(V_c/V_d)$. For example, let's compute the value in the first column, x_H, of the row x_5:

$$80 - 80\,(.000715/.001) = 22.8$$

The new values for row x_6 and x_7 are computed in the same way as the values for row x_5. As an illus-

TABLE A: PRODUCTION DATA

Equipment	Production Rate—Lb/Hr Product 1	Product 2	Product 3	Available Hours
Extrusion Press	1400	1200	1000	80
Stretcher	1400	1100	1400	80
Inspect-Saw	1200	1500	1300	80
Aging Oven	2000	2500	2050	40
Profit per lb	$.03	$.035	$.04	

tration, the new value in row x_6 under column x_1 is

.000835 – .000715 (.00077/.001) = .000285

5. To determine row Z in Table II, deal with each column one at a time. Multiply the value in each row by the unit profit shown in parentheses on the left side of that row. Add these products, and the sum is the value that belongs in row Z. For example, for column x_1 the value in row Z is

.715 (.04) + .000204 (0) + .000275 (0) + .000214 (0) = 0.286

6. Subtract row P from row Z in each column, and enter in the Z – P row.

7. The most negative value in the Z – P row locates the column that will replace a row in the third table. In Table III, x_2 will replace row x_5. Since – .0016 is the most negative Z – P value, x_2 replaces a row in the third table.

8. Follow the procedure outlined in Steps 2 through 7 above to compute the next table, Table III. Briefly, 22.8 divided by .000314 in row x_5 is the smallest quotient when values in the x_{11} column are divided by values in the x_2 column. Hence, x_2 replaces x_5 in Table III. The new x_2 row is computed by dividing the values in the x_5 row of Table II by .000314. New values for rows x_3, x_6, and x_7 are found by the formula in Step 4 above. The Z row in Table III is next determined in similar fashion to that described in Step 5 above. Row P, it should be noted, has the same values in the boxes for all tables. Once again, the P row is subtracted from the Z row, revealing that x_1 will replace a row in the next table, Table IV.

9. Continue computing new tables until in the final table, *all Z – P values become non-negative.*

10. The optimum program is found in the x_{11} column of the final table (here, Table IV).

WHAT THE SOLUTION GIVES

To get a solution, we prepared four tables. Table IV gives the optimum program in the x_{11} column:

x_1 = 18,700 lb
x_2 = 60,550 lb
x_3 = 16,100 lb
Maximum profit = $3325

The solution gives zero values for the slack variables x_4, x_5, and x_7, because they do not appear in the x_{11} column, and a positive value for slack variable x_6 equal to 11.6. The significance of these results is that to reach maximum profit the press, stretcher, and oven must use all the available hours for each, but inspection and sawing (slack variable x_6) does not require the full 80 hours available. In fact, substituting the optimum program into the capacity inequality for inspection and sawing shows that 68 hours is used out of the 80 hours available.

If the company follows this optimum program, then it should realize the maximum profit of $3325. It is apparent that without linear programming the optimum manufacturing program would be far more difficult to find.

Expensive computers and advanced mathematics are not necessarily needed to apply linear programming advantageously. Indeed, LP may well be as useful to the small plant as it already has been to big business.

The method described above, which is the most general approach for solving linear-programming problems, is known as the Simplex method. It permits incorporation of sales forecasts, more than one production machine of the same type, and extra work shifts. Also, the Simplex method can be used to gage the effect of changes in any of the original conditions. Once the small-plant manager acquires facility with the method he can decide in advance which of various alternatives can be pursued for greatest profit.

The *theory* of Linear Programming is complex, but the *application* of this technique is relatively simple. As a planning tool for the plant manager, LP solutions show the best of all possible choices involved in a manufacturing operation.

TABLE I: INITIAL TABLE FROM STARTING EQUATIONS

Slack Variable	Available Hours x_{11}	Production Rate x_1	x_2	x_3	Slack-Variable Coefficient x_4	x_5	x_6	x_7
x_4	80	.000715	.000835	.001	1	0	0	0
x_5	80	.000715	.00091	.000715	0	1	0	0
x_6	80	.000835	.000666	.00077	0	0	1	0
x_7	40	.0005	.0004	.0004	0	0	0	1
Z	0	0	0	0	0	0	0	0
P (Unit Profit)	0	.03	.035	.04	0	0	0	0
Z – P	0	–.03	–.035	–.04	0	0	0	0

TABLE II: FIRST COMPUTATION

	x_{11}	x_1	x_2	x_3	x_4	x_5	x_6	x_7
x_3 (.04)	80,000	.715	.835	1	1000	0	0	0
x_5	22.8	.000204	.000314	0	–.715	1	0	0
x_6	18.4	.000285	.000024	0	–.77	0	1	0
x_7	8	.000214	.000066	0	–.4	0	0	1
Z	3200	.0286	.0334	.04	40	0	0	0
P	0	.03	.035	.04	0	0	0	0
Z – P	3200	–.0014	–.0016	0	40	0	0	0

TABLE III: SECOND COMPUTATION

x_3 (.04)	19,300	.172	0	1	2900	–2660	0	0
x_2 (.035)	72,700	.65	1	0	–2280	3190	0	0
x_6	16.65	.000269	0	0	–.7154	–.0765	1	0
x_7	3.2	.000171	0	0	–.25	–.21	0	1
Z	3310	.0296	.035	.04	36	4	0	0
P	0	.03	.035	.04	0	0	0	0
Z – P	3310	–.0004	0	0	36	4	0	0

TABLE IV: THIRD COMPUTATION—OPTIMUM PROGRAM

	Optimum Program x_{11}	x_1	x_2	x_3	x_4	x_5	x_6	x_7
x_3 (.04)	16,100	0	0	1	3150	–2450	0	–1000
x_2 (.035)	60,550	0	1	0	–1330	3990	0	–3800
x_6	11.6	0	0	0	–.3254	.2535	1	–1.57
x_1 (.03)	18,700	1	0	0	–.1460	–1230	0	5850
Z	3325	.03	.035	.04	35.5	5	0	2.5
P	0	.03	.035	.04	0	0	0	0
Z – P	3325	0	0	0	35.5	5	0	2.5

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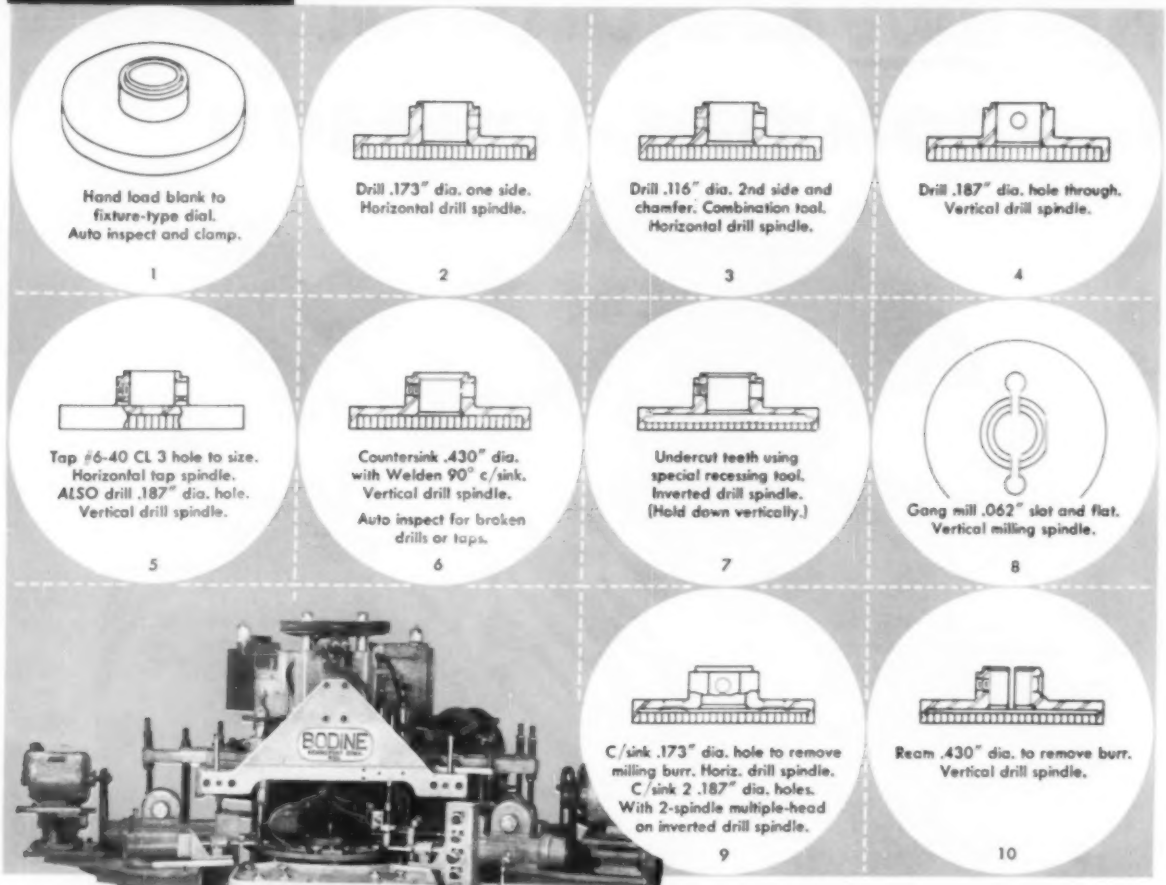
Bodine

CASE HISTORY NO. 48...


Hand load blank to fixture-type dial. Auto inspect and clamp.
1
Drill .173" dia. one side. Horizontal drill spindle.
2
Drill .116" dia. 2nd side and chamfer. Combination tool. Horizontal drill spindle.
3
Drill .187" dia. hole through. Vertical drill spindle.
4
Tap #6-40 CL 3 hole to size. Horizontal tap spindle. ALSO drill .187" dia. hole. Vertical drill spindle.
5
Countersink .430" dia. with Welden 90° c/sink. Vertical drill spindle.
Auto inspect for broken drills or taps.
6
Undercut teeth using special recessing tool. Inverted drill spindle. (Hold down vertically.)
7
Gang mill .062" slot and flat. Vertical milling spindle.
8
C/sink .173" dia. hole to remove milling burr. Horiz. drill spindle. C/sink 2 .187" dia. holes. With 2-spindle multiple-head on inverted drill spindle.
9
Ream .430" dia. to remove burr. Vertical drill spindle.
10
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PART and MATERIAL: Clutch drum, steel B1117

PRODUCTION: 4200 operations (300 pieces completed) per 50 min. hour.

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There are 4 vertical drill spindles and 1 vertical milling spindle; 3 horizontal drill spindles and 1 horizontal tap spindle; 2 inverted drill spindles. Parts are hand-loaded but automatically ejected. The station is washed after ejection.

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REFERENCE BOOK SHEET

Geometric and Positional Tolerancing—I

WALTER H HARRINGTON, engineering standards coordinator,
Avco Research and Advanced Development Div,
AVCO MFG CORP, LAWRENCE, MASS
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To eliminate misunderstandings and misinterpretations stemming from former tolerancing practices, the SAE, and ASA, Defense Department, various associations and individual companies have attempted to standardize tolerancing practice. In 1953 the British published Standard No. 308 on engineering drawing practice, which included a method of tolerancing geometric and positional characteristics. At about the same time, the U S Defense Dept published Military Standard 8A which specified a set of symbols for indicating geometric and positional tolerances. In July, 1954, the Canadian Standards Association published the Canadian standards. In March, 1955, the SAE published a revised Automotive Drafting Standards, covering geometric and positional tolerancing. The ASA has now published a new standard on this same subject.

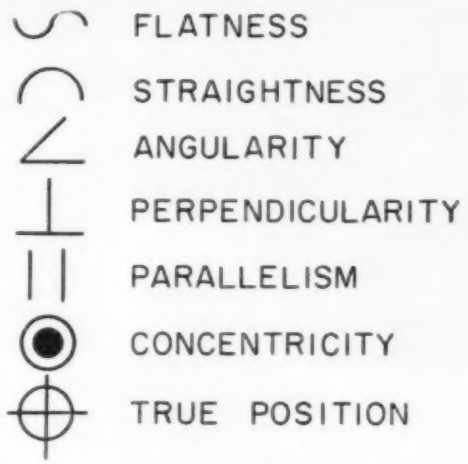

FIG. 1

SYMBOLS

The Defense Department's MIL-STD-8A is mandatory for use by the Army, Navy and Air Force. It specifies a set of symbols (Figs. 1 and 2) for geometric and positional tolerances to be used where appropriate, in place of, or in conjunction with, notes for indicating these relationships on drawings.

Under this system, the datum feature symbol (Figs. 3 and 3A) may be used separately or in conjunction with the geometric tolerance applying to the same feature. A letter is used to identify a datum feature and in the symbol.

The symbol system has an inherent advantage of saving time over the varied note systems because it can:

1. Provide more complete drawings.
2. Express design requirements for interchangeable parts.
3. Clarify engineering intent.
4. Facilitate manufacturing and inspection requirements.

The resultant production draw-

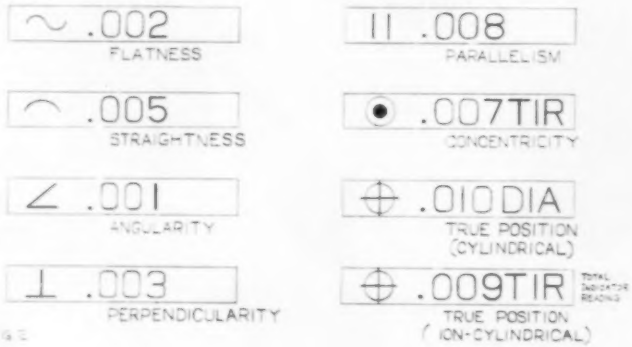

FIG. 2

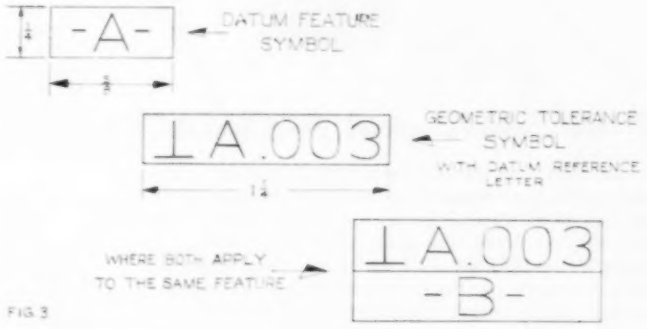

FIG. 3

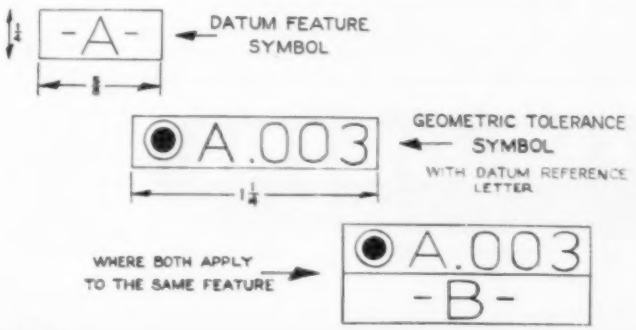

FIG. 3A

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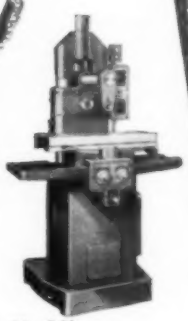
No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.

No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.

No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

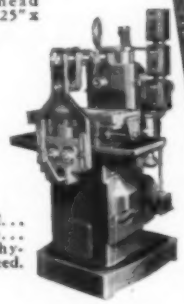
No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.

No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 1-V
Hydraulic vertical head feed ... 5½" head travel ... 25" x 9" table.

No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.



No. 1-8
8" table travel... 25" x 9" table... automatic hydraulic table feed.

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Geometric and Positional Tolerancing—II

ing should represent the part as received by the user, regardless of manufacturing source; deal cautiously with manufacturing and inspection methods; and specify the result to be obtained, rather than the method used to obtain it. Thus, maximum latitude is permitted in optional manufacturing methods.

Dimensions and tolerances are expected to: express engineering intent clearly; leave nothing to the imagination or judgment of the user; assure interchangeability of parts from multiple sources of supply; eliminate rejection of usable material; become part of a purchase contract; and be an unequivocally clear and non-controversial statement of exactly what is required.

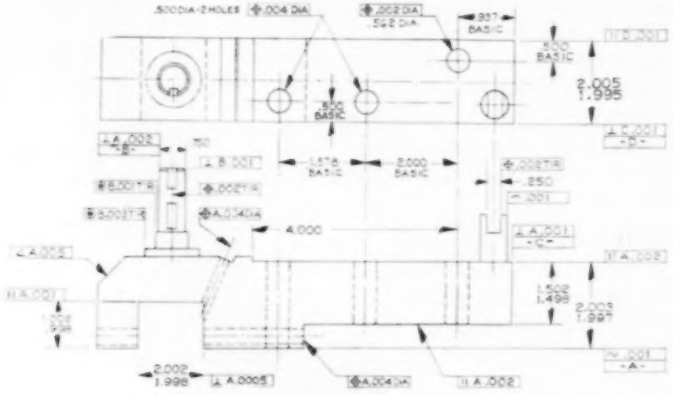

FIG. 4

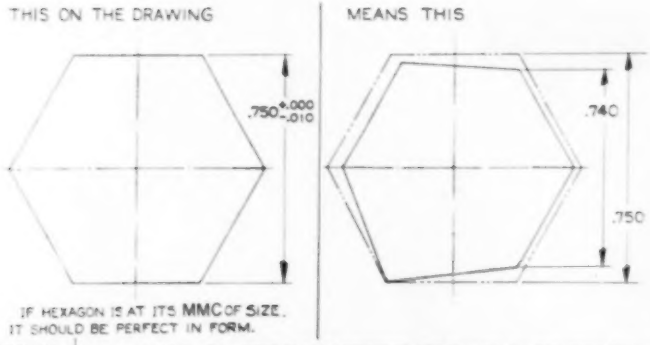

FIG. 4A | SIZE LIMITS GIVEN WITHOUT ANY SPECIFIED TOLERANCE OF GEOMETRIC FORM

Because a perfect form cannot be produced, variations must be permitted. The amount of variations must be restricted if a specific quality of the finished product is to be maintained. Tolerances are thus the definite statement of variations which may be permitted. They should be specified where appropriate for all requirements critical to proper functioning and interchangeability of the product, even though it is reasonably certain that ordinary or established workshop techniques and equipment can be relied upon to achieve the required degree of accuracy.

Geometric tolerances are used where interchangeability of parts is required. They define conditions of flatness, straightness, parallelism, perpendicularity, angularity, and concentricity. These tolerances specify maximum permissible variations from the perfect form. The dimensional limits for all errors include the entire surface concerned, not just a point on that surface.

Therefore, geometric tolerance is the width or diameter of a tolerance zone within which a surface, an element of a surface, an axis, or a plane of a feature is to lie. It represents the full indicator movement in cases where testing with an indicator is applicable.

If no specific tolerance of form is stated on the drawing, it is understood that the part will be acceptable if it is within the dimensional limits given, regardless of form variations. Geometric tolerance is generally specified for the entire surface, axis or plane, regardless of its area of length. See Figs. 4 and 4A.

Because tolerances are given in

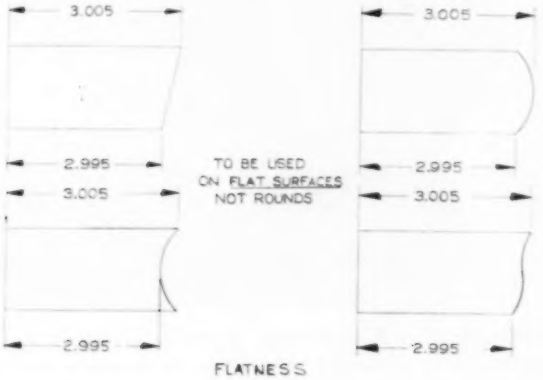

FIG. 6 FLATNESS

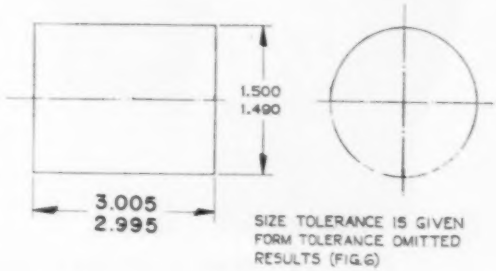

FIG. 5 LIMIT DIMENSIONS

Cold Extrusion from

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To Molloy Manufacturing Co., cold forming of automotive parts like this steering worm called for steel with unusual cold working qualities. Uniformity and absence of surface defects were, of course, necessary . . . but closely controlled conditioning and annealing were absolutely vital. Copperweld, one of the electric furnace steel producers working on this problem, developed special processing methods that produced a steel which met Molloy's cold extruding and upsetting requirements. The production proof . . . parts like these, cold extruded and upset from a $^{29}/_{32}$" round to a finished maximum diameter of 1.440", with substantial savings in material and machining time.

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Geometric and Positional Tolerancing—III

reference to a datum surface, the datum must be available so that measurements can be made from it readily. The datum must be more accurate than the variations in any measurements made from it. Its accuracy may be specified by giving tolerances on its geometric characteristics, such as flatness, straightness or roundness.

Limit dimensioning is illustrated by a drawing of a simple cylindrical piece, Fig. 5. The maximum limits define a maximum permissible profile for the part, and the minimum limits define a minimum limit of profile. These variations may be of any degree, provided no portions of the part exceed the maximum profile limit or are inside the minimum profile limit, and provided there is no conflict with supplementary specifications or with acceptable standards of workmanship. Without specifications, the toleranced dimensions for sizes of features, however expressed, control form as well as size.

Flatness is a condition of a surface which does not deviate from a plane. Variations fromt rue flatness may be wavy, concave or convex. If it is desired to control flatness of the end of the piece to a greater extent than is imposed by the limit dimensions, a tolerance must be specified. The tolerance is the distance between two parallel planes within which all bearing points of the relevant surface must lie and is specified as shown in Fig. 6.

Fig. 6 also shows typical extreme errors of form which could be accepted by this interpretation. The end surface may vary by any amount so long as the entire surface lies within the zone defined by the limit dimensions. However, while the extreme errors shown are possible, they are unlikely to arise in ordinary machining practice.

This control by limit dimensions only is identical with that exercised by ordinary limit gages where the faces of the gages are large enough to cover the entire work surfaces. In practice, however, the relative proportions of gaging faces and surfaces of work features are usually such that these limit gages cannot prove that entire work surfaces are within the maximum material limit of form. Nevertheless, the control imposed by such gages on machined work is ordinarily regarded as adequate.

Fig. 7 illustrates six interpretations of the same requirement; i.e., that all points on the surface must lie between two planes 0.002 in. apart which establish the tolerance zone. It must be remembered that the tolerance as expressed is independent of the size tolerance specified by limit dimensions. The ends of pieces could be as shown in Figs. 8 and 9 and still satisfy the tolerance specification shown in Fig. 7.

Notes on straightness, parallelism, perpendicularity, angularity, and concentricity will be given in an early number.

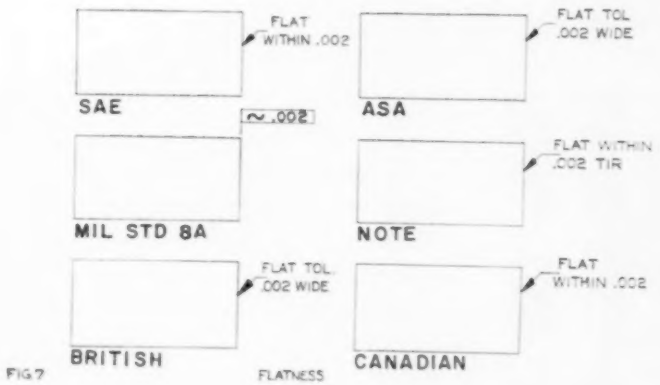


FIG. 7 FLATNESS

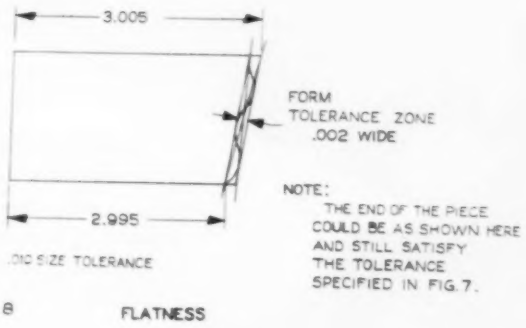

3.005
2.995
FORM TOLERANCE ZONE .002 WIDE
.010 SIZE TOLERANCE
NOTE:
THE END OF THE PIECE COULD BE AS SHOWN HERE AND STILL SATISFY THE TOLERANCE SPECIFIED IN FIG. 7.

FIG. 8 FLATNESS

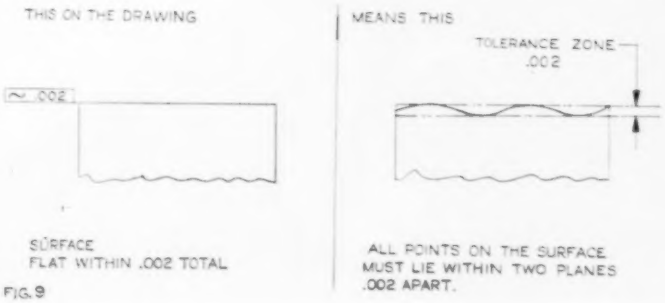
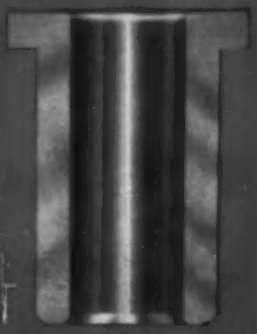

THIS ON THE DRAWING
⏥ .002
SURFACE FLAT WITHIN .002 TOTAL
MEANS THIS
TOLERANCE ZONE .002
ALL POINTS ON THE SURFACE MUST LIE WITHIN TWO PLANES .002 APART.

FIG. 9

for accuracy in your production
it pays to specify

UNIVERSAL DRILL BUSHINGS

In Universal you get the best. Machined from finest quality steel. Blended radius on the top-inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip.



superfinish bores
lengthen tool life
The superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum—especially in close tolerance work.

Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

Write for your copy of our new 98 page catalog describing Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, Universal Index Plungers and other Universal products.

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 1, MICHIGAN

Talking Shop...

F102 Signoff

LAST month Convair's big Plant 2 in San Diego turned out its last delta-wing F102. This was an early delta-wing supersonic plane, and the first jet to be mass produced by Convair. The 102 was a handsome plane and its triangular silhouette has come to symbolize the supersonic era. We were in Plant 2 when Convair was just beginning to turn out prototypes, more than four years ago—just beginning to learn first-hand of the production problems of a supersonic age. Various editors from our staff were back later to see and report—how these problems were being solved. The Air Force may use 102s for quite a while yet (there are 23 active squadrons), but production men are moving on to new designs and new problems as we strive past supersonic to ultrasonic speeds. When the final model went down the line, the canvas covering the jet exhaust nozzle bore the words, "The End."

Vacuum Brazing

THE J93 engine for the projected B70 chemical bomber will have a stainless honeycomb brazed to the titanium outer shroud. I-T-E Circuit Breaker has a contract from GE for the prototype honeycomb. A Stokes vacuum-brazing furnace will do the job at 1800 F with a vacuum of 99.99998%. The furnace will have a ceramic muffle to withstand this temperature and high vacuum.

Pure Iron

THE RUSSIANS are reported to have obtained laboratory samples of a pure iron with a tensile strength of 1400 kilograms per sq mm. If our slide rule works correctly, that is nearly 2 million psi. The Russian press describes this as "almost fantastic" and we are inclined to agree. The laboratory samples described are said to be "very small rods," but are not further defined. Remember that some time ago the GE Research Lab reported isolating single crystals of pure iron with such remarkable strength, but as soon as the crystals were combined the strength dropped. Can it be that the Russians have found a way to combine such crystals, or is it just that their "very small rods" happen to be of 1-crystal size?

The Diamond Angle

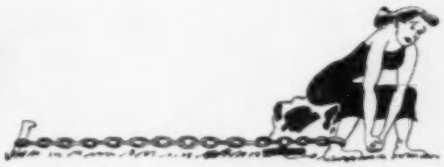
DIAMONDS are a directional substance and will give much better life if oriented in a tool so that the hardest vectors lie along the edges of the crystal while the softest are at 90° to any edge. According to Joe Klipper, the difference between good and poor orientation may be as much as 2 to 20 times the life. Proper orientation depends on the diamond cutter. Methods of X-ray analysis and geometrically exact sawing and cleaving are said to make it possible to produce stones oriented for maximum hardness. Clipper Diamond Tool, for example, has installed X-ray equipment.

Strong Talk

"MOST students do not get to the point where they have mastered the subjects well enough to enjoy them rather than consider them drudgery," said Forest McFarland recently. As executive assistant chief engineer at Buick, McFarland has had ample experience with young engineers. He charges that too often they can't read layouts of designs within any reasonable time. Furthermore, they do not see past the hardware into the basic structure. They are not taught enough basic fundamentals, he feels.

MEMOS

by BESS RITTER



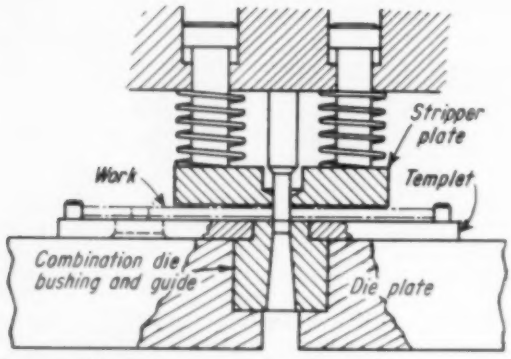
Two thousand and more years ago metal was most important to marriage, because, since it was customary to capture a wife by force, she also had to be kept in the same way—and this consisted of tethering her to her new home via a specially constructed metal chain which gave her approximately 20 feet of freedom. "Woman's Rights" edicts never changed the practice—instead, it was discontinued for a much more practical reason.

Metal was scarce, and household implements made of it were much more in demand. Those who worked in metal made the implements first—and they didn't often have enough material left over for forging marriage chains. What's more, a metal axe earned as high a price as a 20 foot chain—and took a lot less metal. So a metal ring for the lady's finger was offered the bridegroom as a substitute.

Back in the days before the "Iron Horse," American machinists came forward with all kinds of machines which were "guaranteed" to successfully transport passengers and merchandise safely from the east to the unknown far west: One man in New York suggested a treadmill. It was horizontal and its band linked one of its wheels to the carriage wheel. A horse was placed on the treadmill and kept it in motion.

A Pennsylvania machinist built a flat sail and declared that his machine—which operated via windpower—was the cheapest form of transportation possible. A South Carolina machinist designed a machine that was entirely different. It consisted of a brace of bicycle-type paddles, which would keep the wheels of the vehicle going round and round when operated by a pair of men.

Practical Ideas . . .



Templet Locates Work

Our work consists to a great extent of producing metal panels. Their outside dimensions and hole locations vary with each lot; making it impossible to even consider conventional dies. We had to find a method that would be flexible, yet accurate enough to hold center-to-center dimensions within fairly close limits.

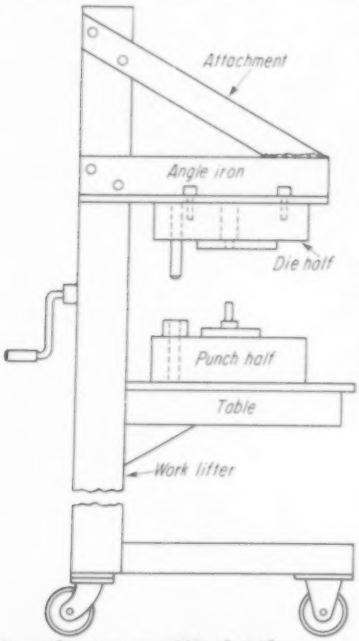
The illustrated method is our solution to the problem. This arrangement employs a templet with jig-bored hole locations for each batch of panels. Locating pins accurately position the panels on the templet.

A die plate bolted to the press table holds a combination guide and die bushing. This bushing is easily interchanged with others of different diameter holes, thus making it possible to pierce holes of many sizes. The die plate is made large enough to serve as working table supporting the templet and workpiece. The only part projecting above the die plate will then be the guide section of the die bushing.

After a templet has been jig bored to a specific layout, a panel is placed between the locating pins. Each hole location is then found by dropping the templet over the guide bushing. A spring-loaded stripper plate strips the panel off the punch on the upstroke of the press.

This method eliminates accumulative errors, and is more efficient than working with a single punch and fixed stop plates. The old method required a lot of manipulation to find hole locations after each panel has been laid out.

N Lenorio, Buenos Aires, Argentina



Attachment on Work Lifter Aids Die Construction

When a progressive die we were constructing proved to be too heavy for regular manipulation we built the attachment shown and bolted it to our shop work lifter. With this setup we can now match the punches to the die without the backbreaking labor usually associated with this operation.

The attachment is made up of two lengths of 3x5-in. angle iron, which serve as the horizontal beams. Two pieces of ⅜-in. by 2-in. CR steel are welded to the angle irons and bolted to the work lifter. No plate or other cross pieces are needed on which to attach the die set; it is bolted directly to the angle irons.

Once the die half is finished, it is bolted to the angle frame to make the work of arranging and securing the punches much simpler. A turn of the hoist handle either opens or closes the die. When the punch has to be brought to the drillpress, the work lifter is pushed over to the press and used as originally intended.

Frank W Geiger, Bergenfield, N J

Clean Drills Chemically

When drilling aluminum, a gradual buildup of chips on the drill point and between the flutes is inevitable. As a result, holes become oversize and the finish is poor. Frequent special grinding, change of speed, and special cutting fluids help, but the buildup continues because of the ductability of the aluminum. Loss of time, scrap, and excessive drill expense are unavoidable.

Here is how I licked the problem: The drills must be cleaned; there is little need for resharpening. Change the drills as soon as the trouble begins. Keep a few of the same size handy so the only loss of time will be in changing drills. Soak the affected drills in a solution of sodium hydroxide—30% concentration—until needed again. They clear up rapidly, and after a quick water rinse are just like new.

Lawrence H Phillips, Waterloo, Iowa

Pin Punch Made From Wrench

Commercially made pin punches are good, but they don't last forever and they cost a bit to replace. What to do then when a punch breaks? The above sketch shows a shop-made punch we use with a lot of satisfaction.

The shank or long end of a hexagonal wrench is cut off as indicated. A holder is made from either round or hexagonal stock and drilled to a diameter equal to the dimension across the flats of the punch bit. The bit and the holder are then joined in a press. Safety should be observed here, and a good way to hold the bit perpendicular is to guide it in a not-too-loosely fitting hole through a block resting on the pressure pad of the press.

Gus Vinciguerra of Tools Inc, Newark, N J

Curling Die Employs Toggle Links

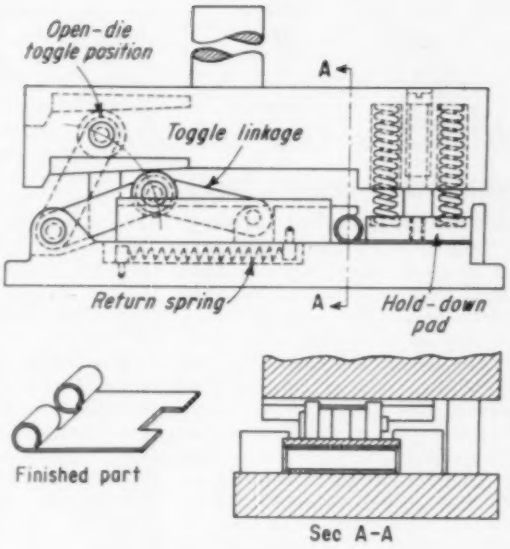
Because of a designing difficulty we found ourselves with a large number of sheet-metal parts to be curled at one end. Our only alternative was to construct as economical a die as possible to finish the job. The illustrated die is of simple design but is a perfect working tool which can easily be incorporated into a progressive die if desired.

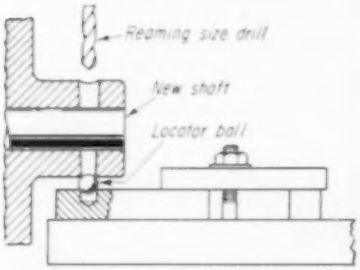
The parts are hand fed and are positioned between the slide guides and a backstop. As the die closes, a spring loaded hold-down pad contacts the part and holds it firmly. The curling slide then moves toward the part actuated by a toggle linkage.

On the upstroke of the die the slide returns with the aid of a tension spring recessed in the base. Presses with relatively short strokes can be used with this die because of the amplified horizontal motion achieved with a toggle-joint arrangement.

Die and punch plates are made from steel plate; the latter being fitted with a die post. They are machined as shown to receive the various parts. A heat treated striking plate is inserted in the punch side to contact hardened rollers in the knee of the toggle. Close-fit-fitting guides are bolted to the die plate on both sides of the slide. (See section A-A).

Hjalmar Dahl, Uplands Vasby, Sweden





Steel Ball Locates Work

When a hole has to be drilled through a shaft in coordination with an existing taper-pin hole in a hub or sleeve, the old accepted method is usually to drill from both sides and hope that the holes meet. After having missed the objective too often, we turned to experimentation and came up with the simple gimmick shown. It employs a steel ball to locate the bottom end of the hole, placing it in perfect alignment with the drill.

The idea is to seat the ball directly under the drill point. This is done by first drilling a shallow blind hole into a piece of scrap steel clamped to the drillpress table. The ball is then seated in this hole, and the small end of the tapered hole is placed on top of the ball.

The shaft is spotted with a drill large enough to be guided by the larger end of the hole. This spot serves to center the drill that will be used to finish the hole to reaming size.

Herb Reichert, Burlington, Wash

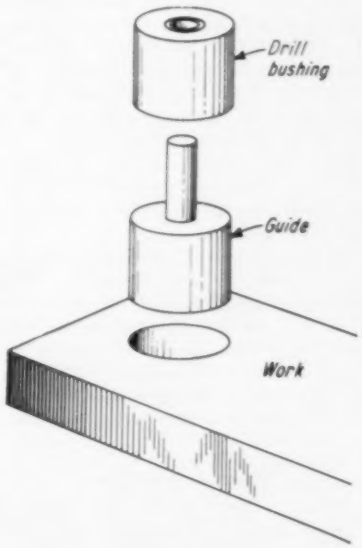
Bushing Guide Retains Accuracy

The most precise job of jig boring holes for drill bushings can be ruined if a bushing is cocked as it is pressed into place. A tilted bushing will shear metal from the wall of its seating hole, falsifying its true location. In addition, drill life is shortened when a drill rubs against the sides of a tilted bushing.

To eliminate this hazard we use guides when pressing bushings in place. Besides making bushing insertion foolproof, they help to speed up assembly considerably.

Any mild steel may be used for the guides. As a quick and easy lathe job they are turned in one chucking to insure concentricity of both diameters. The large part of the guide fitting into the work should be as long as the work thickness for best guidance.

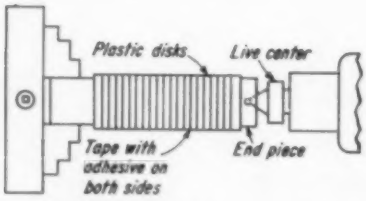
The smaller diameter should be slightly shorter than the length of the bushings to avoid peening. Both diameters must have free, but not sloppy, fits in their matching holes. In most cases, one guide for each size bushing is enough as bushings are generally pressed in one at a time.



To use, slide the guide into the drill bushing. Enter the assembly into the work hole, guide first, and press into place. Remove the guide from beneath the work when the bushing is fully entered.

Norman Fried, Los Angeles, Calif

Practical Ideas...



Double-Coated Masking Tape Holds Plastic Disks For Turning

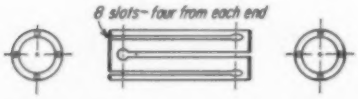
The specifications called for solid disks of plastic, machined to perfect roundness within reasonably close limits and without marks of any kind on their faces. This was an order that seemed difficult to fill, but was, with the aid of double-coated masking tape, relatively simple.

Squares of plastic were sawed out to slightly larger dimensions than the diameter of the finished disks. With the protective paper still in place, and trimmed off around the edges to asure good contact, the squares were stacked with equal size squares of double-coated tape sandwiched between them. We made stacks 6 in. long, but the size of the disks governs this length. Larger diameter disks permit longer stacks.

A piece of round stock about ¼ in. smaller than the disk size was then gripped in a three-jaw chuck and faced off. An end piece of equal diameter, but only ¾ in. thick, was centerdrilled to provide a seat for the live tailstock center.

After sticking a piece of tape on each end of the stack, it was mounted between the chucked face and the tailstock pressure pad. Held this way, the work was rotated at high speed and turned with a tool having a positive top rake.

R G Cavaiani, Iron Mountain, Mich



Adapters Cut Change Over Time

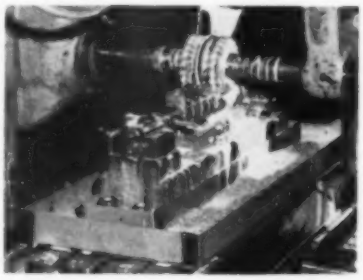
In shop work it is often necessary to change a spindle collet to use an indicator, edge finder, or drill chuck during machining operations. A change back to the original collet will then have to be made when the cutter again must be used. This repetitious changing around adds up to a lot of lost time.

We have reduced this time to a minimum with standard friction inside and outside diameter flexible sleeves. These sleeves are similar to the ones used on some types of expanding mandrels with the exception of the bores, which are parallel instead of tapered.

A piece of brass turned and bored to the desired size and then slotted every 45° makes a good flexible sleeve. Four slots are cut at 90° intervals to within ⅛ in. of the end. The sleeve is then reversed and the four other slots are cut from the opposite end and centered between those slots already cut.

More durable sleeves can be made from steel and hardened, or from long headless drill bushings of standard sizes that have become too worn for precision work. The slots in the bushings can be ground with a thin rubber wheel.

William De Groat, Altadena, Calif



Chip Tray Cuts Cleanup Time

Removable trays are placed around the fixtures in a milling setup at a GMC truck plant to collect chips. When a tray is filled, it is simply lifted away from the fixture and the chips are dumped into a salvage container. This idea, in addition to safety, also improves housekeeping.

Seen in the photo above, these trays are used around fixtures holding tie-rod nuts for milling. The center portions of the trays are cut out and flanges are bent up to fit snugly around the bases of the fixtures. Perforations at or near the bottom allow the coolant to drain off.

In the above photo, this arrangement is used on both tables of a dual-table production miller. The time saved in chip cleaning is utilized to set up work on the second table.

Foster T Speers, GMC Truck and Coach Div, Pontiac, Michigan

F C ASHTON,
Woolton, Liverpool,
England

won $25 in addition to regular payment for his idea:

WORM-GEAR ARRANGEMENT ROTATES RADIUS CUTTER

In the April 7, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

GRAND PRIZE OF $100.

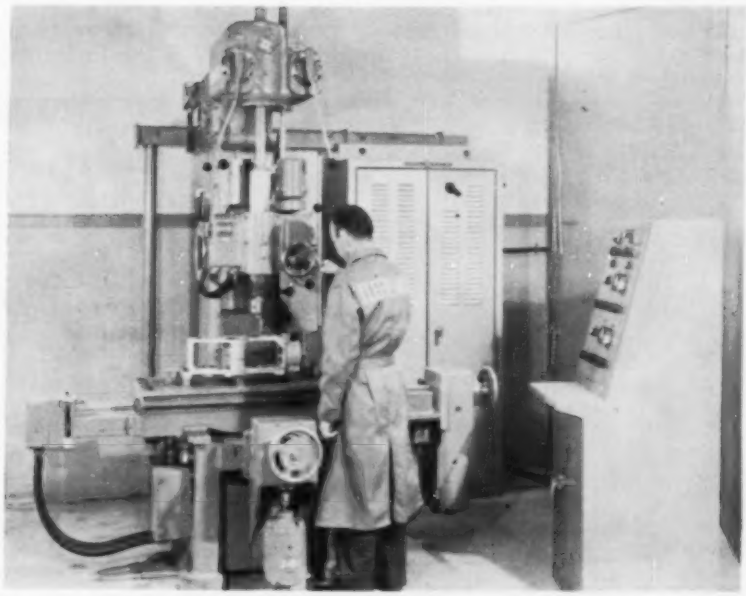
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

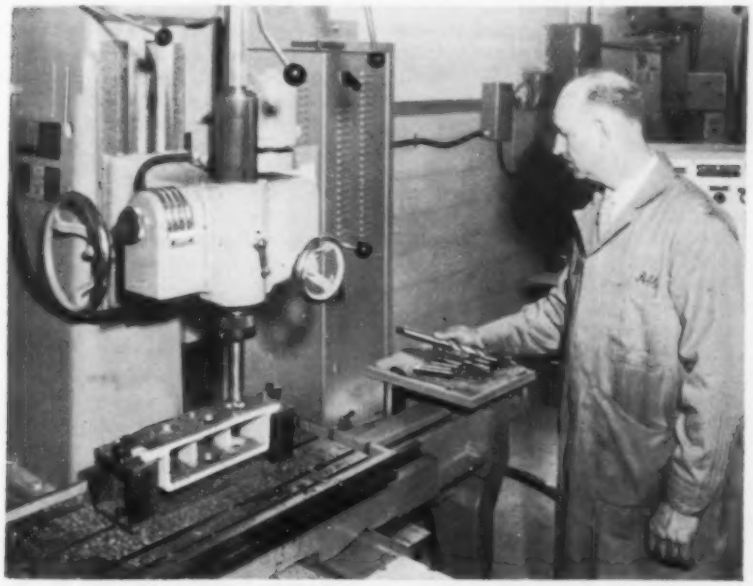
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

New Shop Equipment
Materials and Parts



Numerical position control on this layout drilling machine cut the time for one part from 7 hours per piece to 30 min. per piece. Tape preparation requires one to two hours for a methods engineer without previous numerical control experience. Table moves out automatically, to clear spindle, when tape signal calls for tool change



Floor-to-floor time is 30 min. per piece when tape control and the simple locating and clamping fixture are used to machine this piece. Formerly, operations on this CI feed-gear transmission case were done with a radial drill and a precision boring machine—and required 3.2 hours

Cleereman Adds Numerical Control To Layout Drilling

To meet requirements where the ultra-precision of a jig borer is unnecessary, the Cleereman Machine Tool Co some years ago developed its "layout drilling machine." It is intended for working that large portion of tools, dies, jigs, fixtures, molds, and similar jobs which do not require tolerance closer than 0.001 in. Nevertheless, even working to a tolerance of 0.001 in. calls for considerable pre-machining preparation and setup.

To minimize these preparation and lead-time problems, Cleereman has added a General Electric Numerical Positioning Control system to this standard layout drilling machine. Tape control thus overcomes the limitations inherent in manual positioning without altering the machine's purpose, versatility, or basic function. Tedious and time-consuming jobs, such as studying prints, reading scales and verniers, laying out hole locations, and using hand gages, have been eliminated.

Once a piece has been clamped onto the table it is automatically positioned and repositioned under the spindle to successive hole locations as each machining operation is completed. Preparation of the punched tape, which replaces the high-cost, long-lend-time conventional manufacture of jigs and fixtures, is simple and inexpensive. It does not require the use of a computer and can be handled without changes in operation methods.

Complete equipment is furnished with the machine for positioning movements from numerical input data representing co-ordinate hole locations. Numerical data is all digital and dimensions can be read directly from standard engineering drawings. Also, individual positions can be preselected with digital dials, while machining is in progress, when the job is sufficiently simple to forego preparation of a tape.

The tape used to supply input data

to the machine is standard, one inch wide with eight channels, such as is used with the Flexowriter or IBM automatic electric typewriter. The tape punch automatically converts decimal dimensions into code. Several auxiliary functions can be controlled from the tape to aid in machining. These functions include: indicator lights showing operation and location numbers, power rapid traverse spindle approach and feed engagement, selective depth control, and coolant control.

Specifications for the layout drilling machine equipped with numerical positioning control include: Hole location positioning accuracy, ±0.0005 in.; smallest increment of positioning information, 0.001 in.; max positioning speed, 60 ipm; max-number of positioning cycles, 20 per min; table travel, 14 x 28 in.

The Cleereman Machine Tool Corp, Green Bay, Wisc

Combination Grinder is All-Round Single-Point Tool Grinder

Model CBE-66 chipbreaker and oscillating cup wheel grinder combines the company's CBE-6 and SCE-6 grinders into one machine. Used electrolytically it is an ideal all-round grinder for complete single point tool grinding.

The chipbreaker end of the machine has a vise accommodating tools up to 2½ in. wide. The spindle is insulated from the machine and is equipped with a power pickup for electrolytic grinding. Table reciprocates with a stroke of up to 8 in. Fast table raising and lowering is provided by a hand crank.

On the cup wheel end, the effort and fatigue of manual tool oscillation is eliminated by an oscillating spindle. Oscillation has two variables —both controlled by handwheels. Stroke length can be varied from 0 to 1½ in. for tools up to 2 in., stroke frequency is variable from 0 to 100 spm. Angular setting ranges from 10° above to 25° below horizontal.

Cup wheel end can be equipped with an automatic air table. Standard equipment on the machine includes sealed ball bearings on all rotating shafts, a MistKolector coolant system, and a 25-gal coolant tank with pump and filter unit. Bulletin 249.

Hammond Machinery Builders Inc, 1618 Douglas Ave, Kalamazoo, Mich

Gleason Quenching Press Triples Quenching Production Rates

The No. 117 quenching press utilizes new methods for handling and quenching heated gears and other round, flat and cylindrical parts so that they may be quenched without distortion at a rate three times faster than previously possible. The speed-up is made possible by decreasing the time the workpiece is in the quenching dies, and by an automatic handling system.

Once the workpiece has been delivered to a specific location in front of the machine, it is automatically picked up by the machine and positioned in the quench chamber. A flexing cycle starts as soon as the inner and outer clamping rings close on the workpiece. The part is flexed between the rings with a diaphragming action. This substantially reduces distortion of the part. Then the part is quenched; oil is forced uniformly over and around the part. Pulsing—the momentary releasing and re-applying of all pressure applied to the workpiece by the clamping rings and expander—during the quenching cycle allows the workpiece to contract without undue strains.

Machine can handle ring gears and cylindrical parts up to 8½ in. max dia and 8 in. max height. Cylindrical parts such as spur gears, liners, bearing races, and disks and other similar parts can also be accommodated. A built-in pumping system, capable of 300 gpm, provides adequate quenching oil flow. Volume and rate of flow of the quenching oil is preselected to suit the requirements of the particular job.

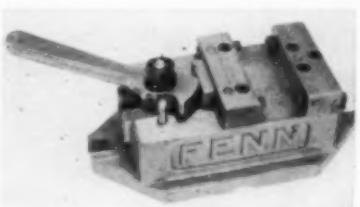
Gleason Works, 1000 University Ave, Rochester, NY

Black & Decker Introduces ¾-in. Magnetic Drillpress

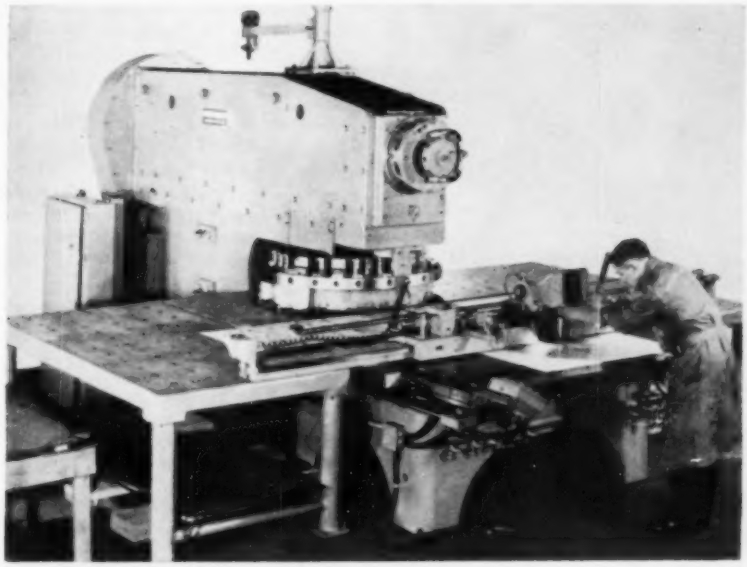
Smaller version of the company's 1¼-in. unit (AM—Oct 21, '57, p202) drills holes within 1/64-in. accuracy in continuous operation on either ac or dc current. Features include drill point locator for immediate, exact positioning; two-piece construction; remote control hydraulic power-feed which enables operator to stand clear of the work. Magnetic base is detachable from the drilling unit.

Drilling or tapping capacity is 13/16 in. in steel, reaming capacities up to ⅝ in. Length of drill stroke is 12 in. Direct magnetic pull is 1850 lbs.

Black & Decker Manufacturing Co, Towson 4, Md



QUICK-ACTION VISE operates with cam lever that opens or closes jaws instantly and uniformly. Eccentric handle then locks the work in a doubly secure power grip. Available in three sizes with extreme openings of 3¼, 4 3/16, and 6 7/16 in.—*Fenn Manufacturing Co, Fenn Rd, Newington, Conn*



Turret Punchpress Works From Full Size, Non-Dimensional Drawing

The 80-ton RA-101 Wiedemann turret punchpress uses a new optical positioning system to locate holes from a non-dimensional, full size drawing. The time required to fabricate panels and other parts measuring up to 48 by 60 in. in a single press handling (48 x 120 in. in two handlings) is substantially reduced. Engineering time is also reduced since detailed shop drawings are not required. Hole-to-hole and edge-to-hole dimensions are unnecessary. Only the outside dimensions of the part are needed.

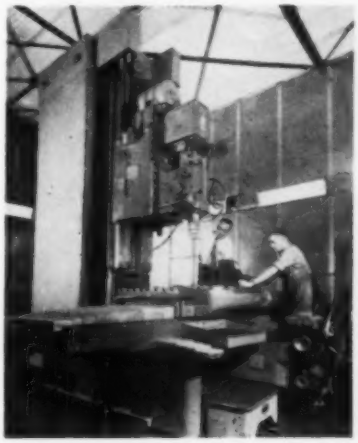
This method is reported to be especially suited for producing short run work with repetitive plans, common to most parts, but seldom falling in the same or relative location on any two panels.

Working from a rough engineering sketch, a draftsman pastes or tapes transparent sub-templets for each opening or group onto a sheet of transparent vellum. When finished, this master drawing is reproduced on a sheet of sensitized paper. This drawing is then positioned on the vacuum table of the press and becomes the actual templet for hole location.

The metal to be pierced is secured to the movable cross-slide of the press in direct relation to the templet. Cross-slide is moved manually in any direction until the magnified center lines of a hole location on the templet line up with the crosshairs on a large ground glass screen. The press is then tripped, and operator moves to the next hole location.

As in other turret punchpresses in the company's line, the punches and dies are carried in a turret. Turret is indexed by means of a foot switch. This particular machine can be converted back to standard metal templet operation by the flip of a switch.

Wiedemann Machine Co, 760 Gulph Rd, King of Prussia, Penna



Jig Borer Locates to 0.0001 in., Handles Workpieces 70 in. High

The 4EA jig borer is reported to have work-size capacity larger than that of any jig borer in the world. Designed for manufacturers whose requirements include machining or inspecting large components with extreme precision, the machine can locate to 0.0001 in. and can accommodate workpieces as high as 70 in. It can bore to the center of a workpiece 80 in. in diameter.

Models are available with or without numerical control. In addition to the increased table-to-spindle distance, the machine provides a combined head and quill travel of 64 in. As a result, the spindle nose can be brought within six inches of the table working surface, and thinner work can be handled without the use of subtables.

Machine weighs about 26 tons and is expected to find extensive use in the aircraft, missile and atomic reactor manufacturing industries. The first two units have been delivered to P&W's West Palm Beach plant.

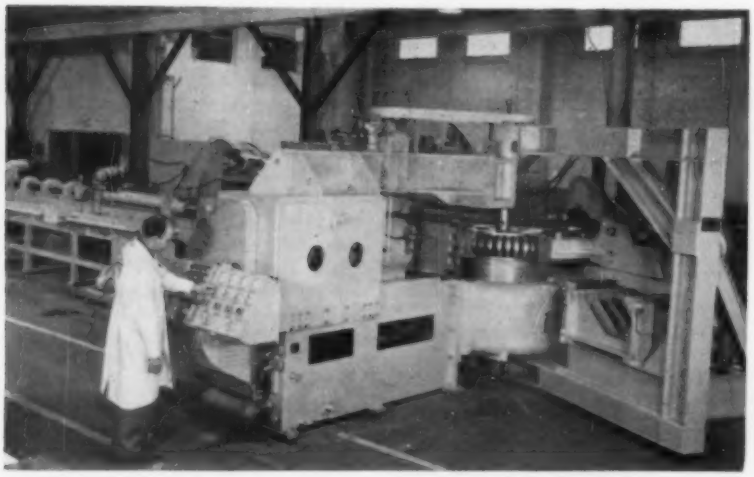
Pratt & Whitney Co, Inc, West Hartford 1, Conn

Optical Gage Reads Direct To 0.0001 in. Over 3-in. Range

Model DR-25, developed by Bausch & Lomb Optical Co, measures depth, thickness, height, and diameter. Measuring range is continuous from 0 to 3 in. with no masters or set gages needed. Measurements are read directly on an illuminated, magnified scale graduated in clearly defined least-reading intervals of 0.0001 in., with an accuracy of 0.000025 in.

Although the extra-large worktable makes it easy to adapt special fixtures, most parts need only to be laid on the anvil (flatness accurate to 0.000005 in.) for measurements to be made. Turn of the control knob lowers spindle until it touches the part; it stops automatically on contact and accurate measurement is instantly readable on the scale. Price is $695.

Distributed by DoAll Co, Des Plaines, Ill



Hydraulic Bender Forms 8-in.-OD Ultra-Thin Stainless Tubing

Reported to be the largest tube bending machine ever built, this hydraulically operated unit forms ultra-thin 8-in.-OD x 0.020-in. stainless steel tubing on a 16-in. centerline radius. Currently, bends of this size are made by the half-shell stamping method, the two shells being welded together to form an elbow.

Features of the machine include a direct-acting hydraulic pressure die, direct-acting C-frame clamping die, and an independent retractable swinging arm that permits removal of the formed tube from the dies at the end of the bending stroke.

A separate setup control panel permits accurate dial pressure settings for clamp die, pressure die, and tube booster operations. Precise pressure settings are made possible by using a direct-acting tube booster attachment. Booster applies pressure to the end of the workpiece during the bending cycle.

To further reduce setup time, all tool carriages are fully motorized and adjustments are controlled by pushbuttons on the main operating control stand. Provision for controlling the speed of the main bending cylinder from the operating panel is also included.

Bending speed control features an electro-servo mechanism remotely controlled by operator. It incorporates a preselected speed variation cam for repetitive cycling. Changes can be made smoothly and without surge during rotation. Different replaceable cam can be provided to suit special range variations.

The special C-frame clamp die design eliminates applying the clamping pressure against the main spindle of the bending form. The clamp lowers into position and locks on the straight section of the bending form to equalize the thrust of the clamping pressure and serves to reduce deflection.

From a tool cost standpoint, another advantage is that the machine is designed so that tooling for existing Pines A-6 and Size 4 aircraft benders can be interchanged.

Pines Engineering Co, Inc, 601 Walnut St, Aurora, Ill

Vacuum Arc Furnace Produces Pure Melts of Metals and Alloys

Designed to provide faster and more economical pilot plant or small-scale production of pure melts of metals and alloys with high melting temperatures, the Model VA-L200H Heraeus vacuum arc furnace is rated at 3000 amps max. It handles melts from buttons to ingots, up to 40 lb of titanium or 70 lb of steel. Five interchangeable crucibles are included.

Fixed electrodes of tungsten or metallic carbides, or consummable electrodes of the metal being melted, may be used. Mechanical pump pulls down a "clean" furnace from atmospheric pressure to one micron in 40 sec.

Suitable for double melting, the furnace is available as an integrated unit, or with the control desk separate.

Distributed by Consolidated Electrodynamics Corp, Rochester Div, 1775 Mt Read Blvd, Rochester, NY

Expanding Collet Requires No Special Attachments or Adapters

The Dunham expanding collet, designed to locate and hold work from the inside, is suited for all existing 5C equipment—lathes, milling machines, grinders, fixtures, etc—without the use of attachments or adapters.

Collet is inserted into machine, and the drawbar is taken up until the taper seats. Movement of the drawbar expands and releases the soft slotted member.

The soft mandrel may be machined to fit any ID within the range of the collet, $\frac{3}{8}$ to $1\frac{5}{8}$ in. Larger and smaller sizes are available; standard length is 1 in. Collet may be removed and replaced in the machine without affecting its accuracy. If accuracy to within 0.0005 in. is desired, a slight truing cut will suffice. The collet operates with the spindle moving.

Soft blanks are available. All surfaces except for the soft mandrel are hard chrome plated. The collets are priced at $15.50 each; replacement bodies, $7.50 each. Complete sets from $\frac{3}{8}$ to $1\frac{5}{8}$ in. will be ground and hardened to specification at $22.50 per collet.

Dunham Tool & Mfg Co, Route 37, RFD 4, Danbury, Conn

OPTIONAL MOUNTING
OPTIMUM PERFORMANCE

BOSTON Gear® OPTIMOUNT

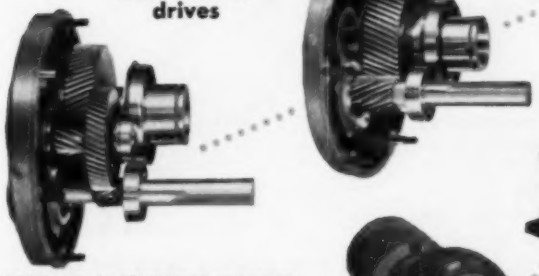
TRADEMARK

HELICAL GEARED
REDUCTORS • RATIOMOTORS
AND FLANGED REDUCTORS
SHAFT MOUNTED and BASE MOUNTED

A New achievement in STANDARDIZATION
by industry's most experienced specialists in speed reducer design

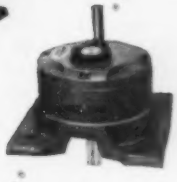
From Stock

SINGLE or DOUBLE REDUCTION
1/6 to 15 HP drives



HORIZONTAL BASE MOUNTED

VERTICAL BASE MOUNTED



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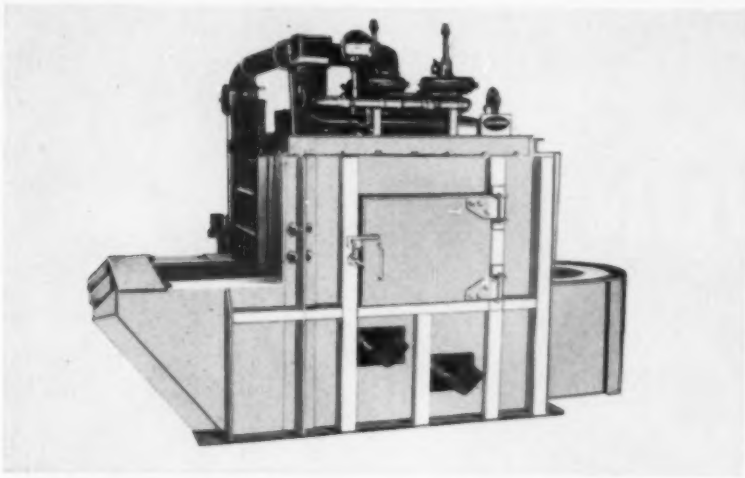
NEW Catalog OP-1 lists complete data on OPTIMOUNT, — selection charts, engineering data. Get your copy from your local Distributor.



Melting-Holding Furnaces Have Capacities From 1200 to 5000 lb

New combination melting-holding furnaces are gas-fired and automatic temperature controlled. Available in capacities from 1200 to 5000 lb, they may be used for die casting, permanent mold casting or sand casting of aluminum.

Rejects and back scrap can be charged back on the sloping hearth —eliminating any contamination of the inside of the furnace with inserts. Furnaces can be built with or without tap holes for complete draining. A bridged ladle-out well allows constant chlorination and a clean supply of metal. Melt loss is reduced by a deep bath and radiant roof heating.

Sunbeam Corp, Industrial Furnace Div, 4431 W Ogden Ave, Chicago 23, Ill

Tumble-Barrel Finishers Have Interchangeable Compartments

Many different finishing operations and a wide range of varied products can be handled with the Model V4 and V6 barrel finishing machines. Machines have 4- and 6-cu-ft barrels with two or three interchangeable compartments respectively. Both models have 23-rpm fixed speed drive, or an optional 12 to 36 rpm variable speed drive.

Other features include vinyl barrel lining, direct chain and sprocket drive, and a complete selection of timing and control accessories. Model V4 has a ¾-hp motor; Model V6, a full 1 hp. The larger V6 measures 51½ in. long x 45¾ in. deep; both stand 49 in. high with 21-in. barrel clearance above the floor.

Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio

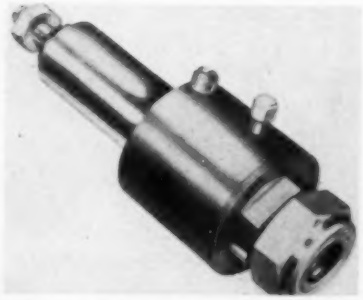
Clark Introduces New Line of Electric Fork Lift Trucks

Known as the Clarklift Electric line, this series of trucks utilizes a new type of "carbon pile" drive control which provides constantly smooth acceleration from a standstill to full maximum speed and permits full control of inching during operation.

Both the pump motor and the drive motor are accessible for maintenance, as are the contactor panel and the batteries. Truck has rear steer wheels the same diameter as the front drive wheels to give easier steering and more comfortable ride.

Major components of the electric and gas models of similar capacities are interchangeable. The 2000-lb model, the first in production, is called the EC-20. It travels up to 6.5 mph both forward and reverse and has a lift speed, loaded, of 50 fpm. It has a turning radius of 67¼ in., a width of 34½ in. and a wheelbase of 44 in. It is available with either a standard or a Hi-Lo upright. The upright will tilt 12° backward and 6° forward to facilitate horizontal load pickup while truck is on an incline. Forks are adjustable laterally up to 30 in.

Clark Equipment Co, Industrial Truck Div, Battle Creek, Mich



Deep Hole Drilling Tools For Use On Multiple Spindle Automatics

Tools are available in four different models to fit all types of multiple spindle automatic screw machines.

Oscillating motion (0.006 in. three times per rev of drill) is derived from a flutter or wave cam built into the tool. Unit is driven by the drill speeder spline shaft. This oscillating action breaks the chips into fine granules, affords longer drill life through cooler running. In addition, finer finishes, closer tolerances, and better concentricity are reported.

If spindle speed of job is not high enough, the revolving tool is used to increase the surface feet. By revolving the drill in the opposite direction of the spindle, it is possible to attain proper surface feet as well as definite improvements in concentricity. It will also afford faster cycle time, according to manufacturer. Variations in drill speed are obtained by using the various gear ratios available in the drill speeder drive of the machine. Standard, fast spiral drills are recommended.

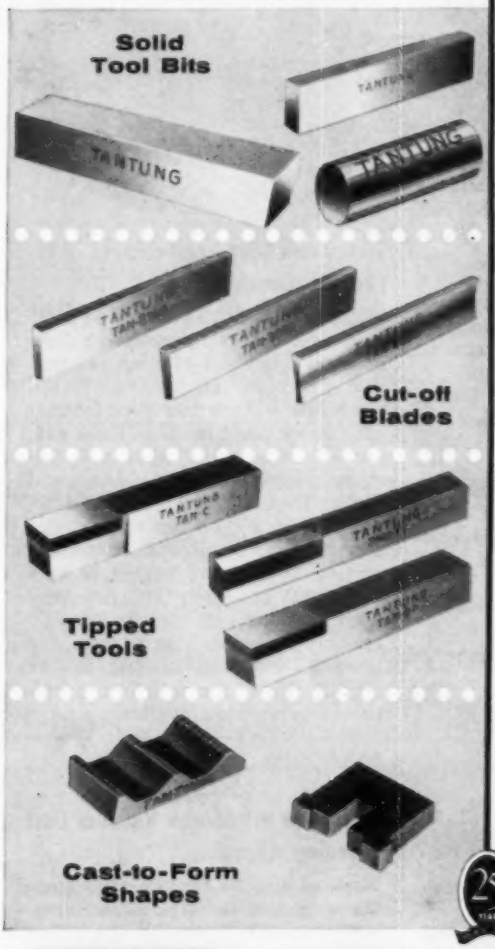
Boyar-Schultz Corp, 2000 South 25th Ave, Broadview, Ill

V-R TANTUNG Cast Alloy

is your best in-between* cutting tool material

*in-between

maximum speed for high speed steel and minimum speed for carbide



Here's what Tantung is. It is a cast alloy with high red-hardness, high transverse rupture strength, low coefficient of friction and high shock resistance.

TANTUNG bridges the gap between maximum cutting speeds possible with high speed steel and minimum speeds practical with carbides. Generally, TANTUNG can be started at speeds 50% higher than HSS and on many applications 100% higher.

Easily ground

TANTUNG is easy to grind, straight or to form, with aluminum oxide wheels. No diamond wheels required.

Lower tool cost

TANTUNG is available and stocked in solid tool bits, square, rectangular and round, permitting many regrinds, a variety of cut-off blades and tipped tools. Special shapes cast-to-form to your prints reduce grinding costs and insure longer tool life.

Many applications

TANTUNG will appreciably reduce machining costs on older machines which lack speed or rigidity to use carbide. TANTUNG is ideal for use on multiple operations where a wide variety of speeds are encountered.

SEND FOR LITERATURE

V-R Catalog

V-R Booklet—Where and How to Use Tantung Cast Alloy.

MANUFACTURERS OF: CEMENTED CARBIDES, TOOLHOLDERS, AND TANTUNG® CAST ALLOY CUTTING TOOLS

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SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

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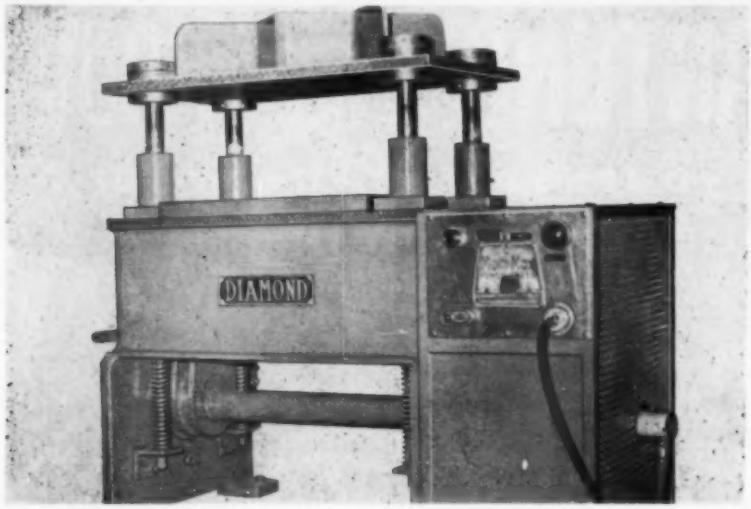


Multi Max 20-Ton Punchpress Speeds Short Run Production

Developed for short run production and standby tooling, this 4-post, 20-ton Multi Max punchpress can be quickly converted for automatic stamping by adding any standard roll feed or hitch feed. Accessible for manual or automatic feed from any or all four sides, this machine is reported to be ideal for assembly line work, or as an integral stamping station in an automatic stamping line. Electrical controls include single stroke, continuous running, inching and jogging. Half-stroke operation is also available; the press will descend to bottom of stroke and dwell for any predetermined period or stop for such operations as induction welding of parts in assembly.

Model shown has 1½-in. stroke, speed of 350 spm, a 10-in. die shut height, 2-in. ram adjustment, bed and ram size of 20 x 24 in. Other sizes and strokes available.

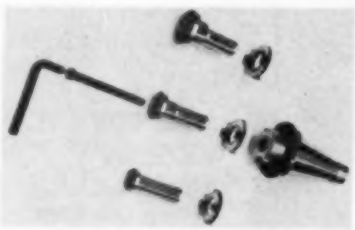
Diamond Machine Tool Corp, 5111 Coffman-Pico Rd, Pico, Calif

Micrometer Measures Internal, External Metal Cuts and Grooves

The Multi-Mike, 8⅞ in. long, carries a standard micrometer head. Two disks, each 0.547 of an inch in diameter and 0.025 of an inch in thickness, ground and lapped to fine gage tolerances, form the jaws or measuring surfaces. Other sizes can be furnished for special applications. Measuring capability ranges from 0.050 to 1.050 in., and in measurement of lands or widths between grooves, from zero to 1.000 in.

Measurement of grooves can be accomplished in holes as small as 0.550 of an inch in diameter. Device also will measure groove distances from an external reference surface to a probe depth of 5 3/5 in. It can be adapted for use as a snap gage in inspection of internal and external grooves during high production runs. Descriptive brochure is available.

Consolidated Aircraft Products, El Segundo, Calif

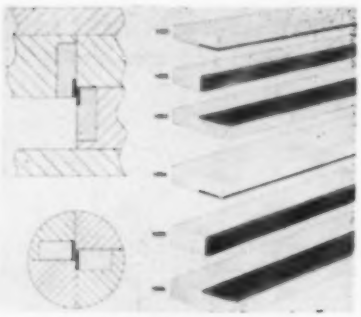


New Milling Machine Arbor Has Interchangeable Centering Inserts

Arbor, said to replace six or eight of the conventional type, has been developed by Stieber & Nebelmeier of Munich.

It consists of a base arbor which always remains in the spindle, and three or four interchangeable centering inserts of different diameters. These inserts completely absorb the axial and radial forces and are clamped from the front with a special long screw with unusually high clamping power. Rigid connection is maintained between milling cutter and arbor in both RH and LH rotations. Cutters of varying widths can be used and, since they may be replaced without changing the base arbor, use on boring mills is also of special advantage.

Imported by A & H von Tsurikov, 755 Lake Ave, Rochester 13, NY



Slides and Gibs Available For Die Construction

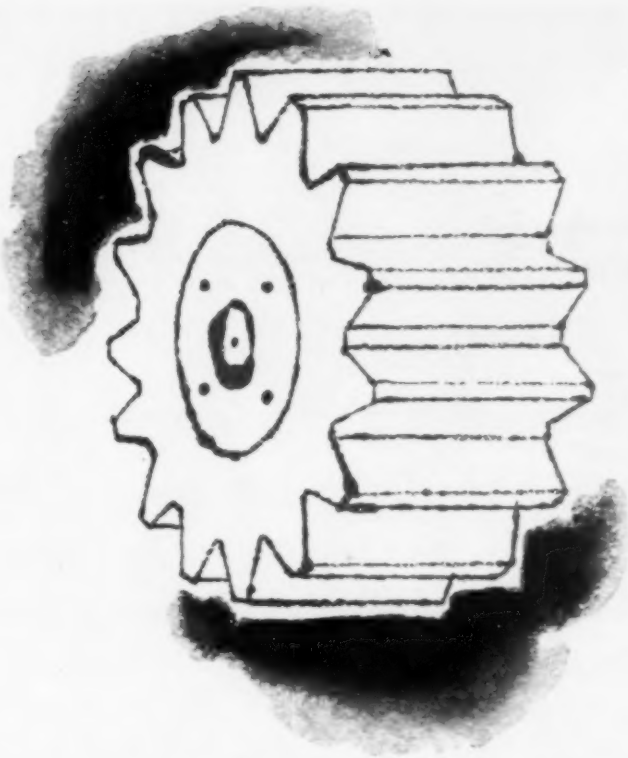
Six new standard composite sections have been added to company's line, making a total of 17 such sections now available. In addition to the composite sections now used for cutoff, blanking and forming, these new sections offer many other uses, including applications for draw and pinch trim dies, heels, forming, flanging, back-up plates or as guides and hold-down gibs. Sections are carried in stock in lengths or bars up to 125 in. They are delivered with the cutting or forming edge already hardened, machined and ground. Soft steel backing can be quickly drilled for dowel and screw holes. Data sheets available.

Ohio Knife Co, Dept W-77, Cincinnati 23, Ohio

Pangborn Introduces Vacuum Cast Cleaning Abrasive

Made of electric furnace alloy steel, the new steel blast cleaning abrasive, known as Rotoblast Steel Shot, is shotted by an exclusive vacuum cast method said to provide greater density, extreme uniformity, toughness, and a narrow hardness range. Available in all standard SAE sizes, the abrasive is shipped in 50 lb bags.

Pangborn Corp, PO Box 380, Hagerstown, Md



Gears... Cutting Oils... and How to Save Money

The more gears your equipment can hob before tool change, the lower your cost of operation. Sinclair Ordnance Cutting Oils have earned the reputation for increasing tool life because of their high heat dissipation characteristic. Furthermore, a special E. P. agent assures the highest quality finish . . . more money saved through fewer rejects. Switch to Ordnance, now. Next time management asks how you've cut costs, tell them you've changed to Sinclair—and show them the results.

Call your Sinclair Representative for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There is no obligation.

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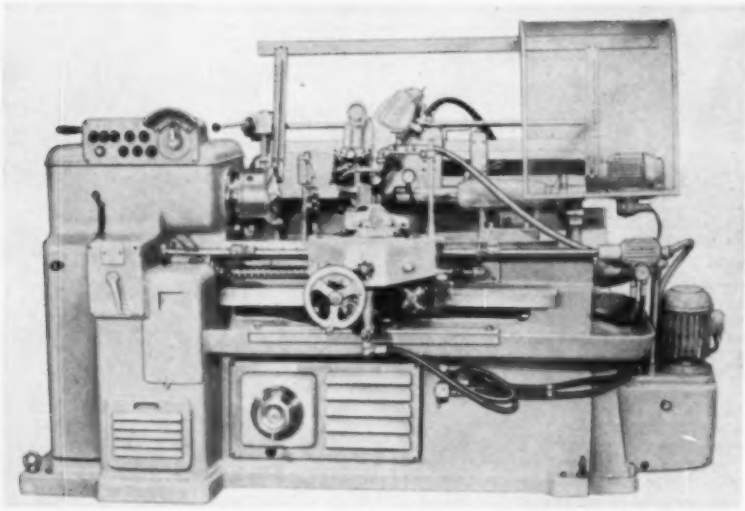


Automatic Threading Lathe Performs 5 Operations With Single Chucking

Hydro-Magnetic Model 13-36, with aid of new accessories designed integrally with the basic machine, is capable of tracing, turning, facing, cutting off, and automatic cycle threading with a single simplified chucking operation. Need to chuck the work only once insures absolute concentricity even when holding on rough diameters. Simplified single point tooling for each of the operations is said to result in fast, highly precise production.

Tracing is performed internally and externally from a master which can be a duplicate of the work. Slide is mounted in a 30° vertical position whose movement is supported by ways that are parallel to the axis of the work. This permits complete tracing access to the full swing over the bed of the machine.

Man-Au-Cycle Corp of America, 132 54th St, Brooklyn 32, NY

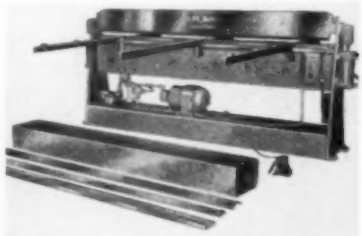
torque at 2.5 rpm constant speed is provided by a 2-hp brake motor. The 72-in.-dia 8-slot table, 2½ in. thick, has 1° increment marks at periphery with indicator to establish degree of rotation.

Powered horizontal base mounted on four V-groove wheels allows 3 ft forward and reverse movement of the unit. Movable base is powered by a ¾-hp gear motor and is equipped with cam-lock handle to secure positioner on track during setup and drilling operations. Control station is on 110-v safety control circuit with 20-ft remote control 4-button station.

Aronson Machine Co, Arcade, NY

Turntable Positioner Designed For Drilling, Tapping Operations

Model FT75CS has load capacity of 75,000 lbs, center of gravity location within 12 in. of center of table. Table rotation with 35,000 lb-in. of



Sheet Metal Bender Handles Long, Light-Gage Work

The Chicago Speed-Bender is particularly suited to production bending of heating and ventilating duct sections and similar long, light-gage work. Machine has a bending length of eight feet. Besides adjustable front gages, there are two disappearing pin gages in the lower die, which can be used to bend notches in the sheet. Standard equipment includes a removable 90° female die. The ram, also removable and adjustable, has a 2-in. stroke and is an acute-angle male die with the bending edge induction hardened for longer life.

Power operation is by two cylinders and a balanced vane-type hydraulic pump driven by a 3-hp motor. Off-on pushbutton station is mounted on front of machine. Actuation is by foot switch.

Dreis & Krump Mfg Co, 7400 S Loomis Blvd, Chicago 36, Ill

Parts Washing Machine Offered In Vertical Conveyor Model

Unit requires only 16 sq ft of floor space as compared with conventional horizontal model occupying 44 sq ft. Operation is completely automatic.

Work is handled by a separate loading conveyor which carries it to a charging hopper. It is then fed through an opening of the machine housing into a series of perforated flights that are attached to a double chain conveyor designed for positive loading to eliminate spillage. During upward travel of the flights the work is subjected to thorough spray action cleaning. Solution is handled from the tank, which forms the base of the machine, to the sprays by pump. It returns down through the machine housing to tank for recirculation. At upper end of conveyor travel in the machine housing the flights are inverted when passing over the head sprocket. Work is discharged into an unloading chute that can be used to carry it on to the next manufacturing stage.

Over-all dimensions are 4 ft wide by 4 ft long by 11 ft high. Production rate is 2000 pieces per hr. Wide variety of adaptations can be made to meet specific requirements.

Ransohoff, Inc, North Fifth St and Ford Blvd, Hamilton, Ohio

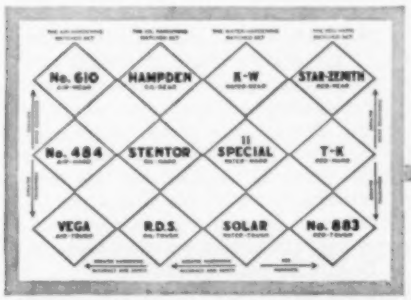
Bill's the new toolroom foreman. Just joined the company. And he no sooner got settled than he was tossed a "hot potato".

The production department was using a compound punch and die for stamping parts out of 12- and 13-gauge hot rolled mild steel. The last die — one of many made from an oil-hardening grade — cracked after a run of 10,000 pieces. And the boss was fed up!

Bill moved fast. He called for a rush delivery of VEGA from his nearby Carpenter SERVICE-CENTER. He learned long ago — VEGA's the toughest of all air-hardening tool steels.

After remaking the punch and die it was heat treated to a hardness of Rc-58/60. Then it went on the job. 150,000 pieces went through before the tools were reworked. After annealing, machining and rehardening the tools, another run of 150,000 pieces is expected.

Why not try VEGA (Air-Tough) today. Over and above its high toughness, it gives you a combination of heat treating, diemaking and production benefits unmatched by any other steel. For fast service call your nearby Carpenter SERVICE-CENTER.



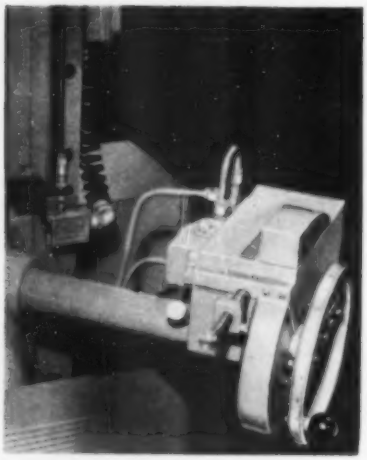
® U. S. Patent Office, The Carpenter Steel Co., Reading, Pa.

Carpenter STEEL

Matched Tool and Die Steels

The Carpenter Steel Co., 109 W Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

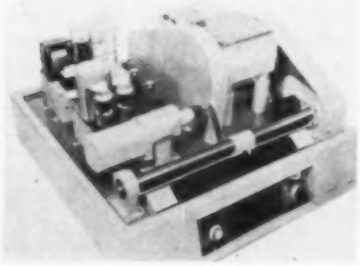


Automatic Cycling Available on Hydrabrasive Surface Grinders

Flats, slots, shoulders and shapes can now be ground automatically to close tolerances on hydraulically powered Hydrabrasive precision surface grinders. By setting the automatic down-feed to actuate either on the table reversal or saddle reversal, the equipment will operate to preset tolerances. Depending upon the finish required, the unit can be set for either one, two or three spark-out passes before automatically shutting off.

Automatic down-feed is set with an infinite increment adjustment of from 0.0001 to 0.0025 in. on the elevating handwheel. Adjustment can be made while machine is running. As extra equipment, a special control is available which, at the push of a button, makes the head feed down the preset amount. Brochure available.

Abrasive Machine Tool Co, Dexter Rd, East Providence, RI

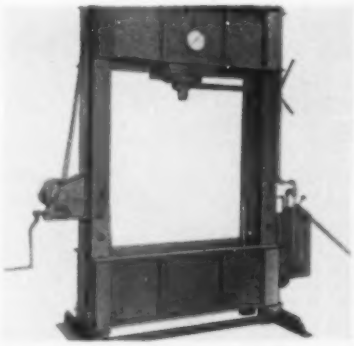


Electro-Mechanical Control System For ¼ to 100-hp Applications

Simplified control systems of improved dynamic response with high accuracy and assured repeatability, initially used on tracer lathes, have a wide variety of applications. These include use as variable and precise speed controls; vibration exciters; process and proportioning controls; servos for aircraft, trucks, automobiles, and materials handling equipment.

System may be used in conjunction with computors or with signal sources sensing linear motion or distance, pressure, temperature, flow and speed, as well as with manual controls. Components include a signal comparator (electrical or mechanical), power supply converter, electronic amplifier and mechanical power amplifier. Output may be either uni- or bi-directional.

Seneca Falls Machine Co, Electronics Division, 12 Fyfe Bldg, Seneca Falls, NY

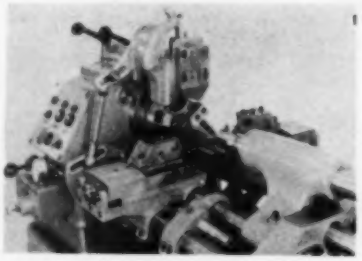


150-ton Heavy-Duty Shop Press Also Handles Light Pressure Jobs

The KRW 37KAA-150, designed to handle jobs up to 150 tons, is sensitive enough to process work requiring only the lightest pressure.

It is equipped with new heavy-duty geared winch with load securely held at any point to permit one-man adjustment of bed height. A 2-speed, hand-operated pump gives operator complete, accurate control of ram pressures. Open side construction combined with extra large daylight opening permits handling of extremely large bars or shafts. Additional features include Capstan handwheel that speeds ram to work in seconds and can be operated mechanically to 3 tons; pressure release control valve that can be opened or closed with a flip of the finger. Model is available as a hand-operated or motor-driven unit. It can be purchased as a hand-operated machine and converted to motor drive later with the KRW conversion package. Bulletin 2-A available.

K R Wilson Inc, Hydraulics Division, Main St, Arcade, NY



Single Spindle Chucker Added To Traub Line of Automatics

Model AF 130 incorporates an air chuck with over 5-in. capacity. Its rigid cross-slides can be moved longitudinally, independently. Max turning length is 5½ in.

Spindle brake is equipped with an electro-magnetic clutch, and there is ample, easily accessible chip room provided in the base. Unit is recommended for secondary operations such as turning, facing, boring, or forming of all types of metal parts. Literature available.

Guthery Machine Tool Corp, 38-31 Crescent St, Long Island City, NY

Automatic Nameplate Marker Is Solenoid Controlled

Model 222 pneumatically operated machine for marking on pre-formed nameplates uses a roll principle in operation.

Interchangeable T-head design marking type is contained in an inner chase which nests the nameplate. As the master chase is moved into the machine head, a microswitch automatically actuates the pressure roll beneath the chase, impressing the type into all blank panels of the plate in one stroke. Marking capacity is 500 to 700 plates per hr. Large variety of type character sizes are available from 1/32 to ½ in. Details in bulletin 146-C17.

Jas H Matthews & Co, 3704 Forbes Ave, Pittsburgh 13, Penna

Why do dies need less maintenance in the Wean "Flying Press"?

Before answering the question, perhaps we'd better establish the fact: firms which have conducted comparative die life tests report that significant savings have been achieved with the "Flying Press." One company reported a 36% monthly reduction in die maintenance costs, noting that part production between die grinds on one run was increased from 4,000 to 123,000 pieces. Another "Flying Press" user reported that dies which had previously required repair every three weeks in a conventional press ran for a year with only one grind in the "Flying Press" . . . and turned out over 1 million parts!

The answer to this cost-cutting aspect of "Flying Press" operation lies in its unique design. Since the dies are in motion in the "Flying Press," they operate at a lower temperature than in conventional presses. Another factor is the higher punching velocity inherent in the "Flying Press" design, with its 600 strokes per minute top speed. Other "Flying Press" features . . . such as its lower bed suspension system which minimizes side thrust on the gibs, and its dynamic balance . . . also contribute to longer die life and sustained accuracy of press adjustment.

Finally, dies are protected against damage by the protective devices built into the "Flying Press" to detect "cobbles" and prevent double hits. And the "Flying Press" uses standard dies, so there's no special expense involved in its tooling.

Operating economy is just one more reason that you should investigate this outstanding piece of metalworking equipment if your plant uses stamped parts in quantity. We'll be happy to send you literature or arrange an appointment for a Wean sales representative to discuss the potential of the "Flying Press" for your specific production operations. May we hear from you?

WEAN

WEAN EQUIPMENT CORPORATION

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HOW TO GET *MORE* FOR YOUR CASTING DOLLAR

Accurate analysis of your casting costs should include a thorough knowledge of the scope of your suppliers' operations. Monarch's new brochure gives you an informative guide to our modern manufacturing methods.

- Growth of casting usage
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MONARCH ALUMINUM MFG. COMPANY

9205 Detroit Avenue Cleveland 2, Ohio

NEW SHOP EQUIPMENT

Retaining rings, tradenamed Rotor Clips, come in all standard sizes and styles. Standard rings are carbon spring steel with oil-dipped finish. Other materials and finishes, as well as special sizes, are available on special order. Each ring is engraved with ring size, offering foolproof size identification. Special tapered design lowers the stress at mid-section. Rings are also available stacked on rods for automatic assembly operations. Catalog available.

Rotor Clip Co, 11½ Allen Blvd, Farmingdale, LI, NY

Socket setscrews and keys are available in kits containing 50 each of selection of sizes from No. 4 up to No. 10, and ¼ in. dia. Kit No. 210 is made up of hex socket screws, No. 211, multiple-spline socket screws. All are Class 3A fit. Details in bulletin 762.

Bristol Co, Socket Screw Div, Waterbury 20, Conn

Lift truck mast, designated Tri-Lift, is available for cushion- and pneumatic-tire lift trucks in the 3000 to 5000-lb classifications. Eleven basic sizes, including three standard sizes, are available. The three standard sizes provide total lifts of 144, 180 and 216 in. from masts with lowered heights of 71, 83 and 96 in. respectively. Open space between rails improves visibility.

Allis-Chalmers Mfg Co, Engine-Materials Handling Div, Milwaukee, Wis

Milling cutters for facing aluminum and its alloys have generous size HSS blades for extending blade life and ample length for deep shoulder cutting operations. Blades are securely held in cutter body by ta-

"When you said you were a 'company man,' which company did you mean?"

Large or small INDUSTRIAL CUT GEARS

- FURNISHED COMPLETE
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- HEAT-TREATED, CASE OR FLAME-HARDENED

SIMONDS GEAR produces a complete line of industrial cut gears in a full range of sizes from cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite. Also heat-treated, case or flame-hardened carbon or alloy steel. Or, you may have your own gear blanks custom cut to your order. Same quality . . . same prompt service. Send us your requirements for quotation.

ALSO stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

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SIMONDS GEARS

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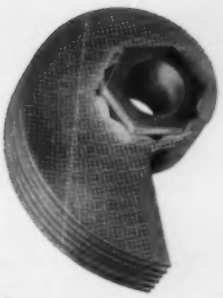
LIBERTY at 25TH PITTSBURGH 22, PA.

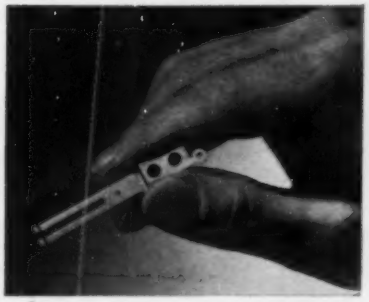
Quality Gears for over 65 years

▲ **Beam Switching Tube: 1 cathode, 10 targets, 10 spades to align.** This 21-element tube component had to be inspected fast enough to keep up with assembly speed in mass production, yet all elements had to be within .002″ of specification. Optical gaging with a Kodak Contour Projector provided the required speed and reduced inspection costs by spotting defects immediately after assembly.

Code Rod: 1100 holes to inspect. This steel tube, used in a high-speed printer, has more than 1100 tiny holes to be inspected for lateral and angular tolerances of ± .0015″. Conventional methods permitted inspection of 1 or 2 rods a day. With optical gaging the rate rose to 15-20 per 8-hour shift. ▶



▲ **Tuning Condenser: spacing parallelism.** Very close tolerances had to be held in spacing the parallelism of a special tuning condenser for electronic test equipment. Optical gaging with a Kodak Contour Projector permitted economical measurement to an accuracy impossible by other methods.



▲ **Wiper Spring: 24 dimensions . . . 3 minutes.** This vital component of a telephone dial switching mechanism has 24 dimensions to be checked. Inspection rate with a Kodak Contour Projector is 3 minutes per part, compared to an hour using mechanical gages.

One instrument inspects these varied parts

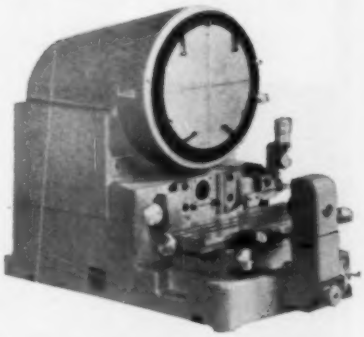
With optical gaging, switching from one type of part to another requires only a change of chart-gage and fixture. You can use the same basic instrument. And with a Kodak Contour Projector the variety of parts you can check is almost unlimited. Here's why:

• **Capacity**—Screen size does not restrict the size of parts you can handle. Multiple-position fixtures let you handle parts bigger than the screen itself. What's important is the staging area—and Kodak's unique relay lens provides uniform ample clearance regardless of magnification. Distortion-free image permits measurement anywhere on the screen.

• **Ease of operation**—Kodak Contour Projectors are designed for maximum speed and minimum operator training. Bright screen image reduces fatigue, permits working in normal room light. Finger-tip controls are within easy reach of the operator.

• **Optical Stability**—The accurately prepositioned optical elements on Kodak Contour Projectors eliminate the need for adjustments by operator. Rigidly mounted lenses and mirrors maintain alignment and position. Rugged construction withstands heavy use.

For more details on how optical gaging can save time and money in your operation, send for the booklet, "Kodak Contour Projectors."



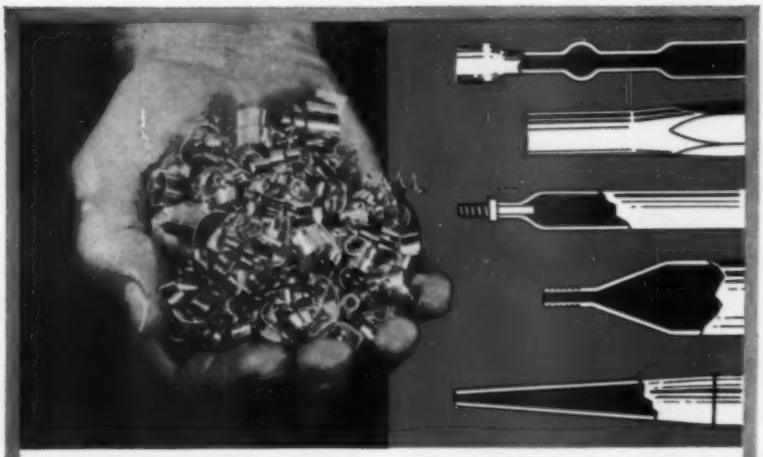
Almost any inspection job can be done quickly and accurately on a Kodak Contour Projector. Operators need little training, work in comfort because controls are easy to reach; bright screen image reduces fatigue, permits use of instrument in normal room light.

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

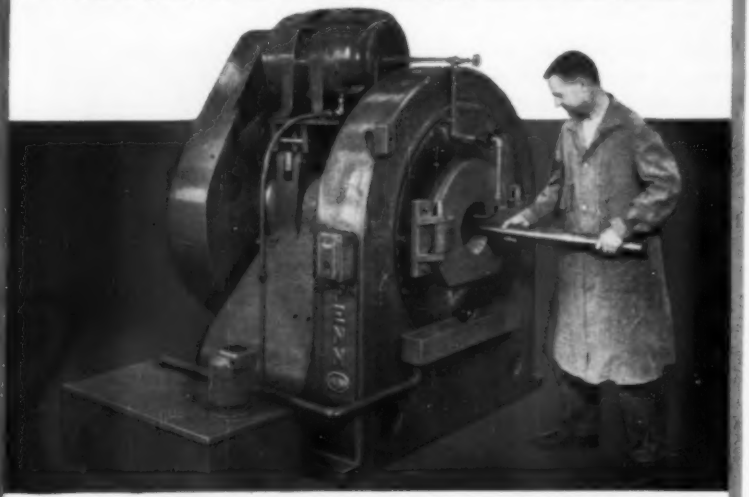
Kodak
TRADE MARK



chips...or parts

Which are you paying for?

Fenn rotary swaging can have an important role in reducing the cost of your product . . . and making it better. This modern method of chipless part making is fast, versatile, accurate (to ± .001") . . . saves money and metal. Plenty of it! You save in capital investment, labor, material and time. Here's an example—A precision shaft was formerly made from a five piece assembly at a cost of $130.00. Now, swaged from tubing, it costs $20.00 . . . a savings of 85%. To be sure that you are not paying for chips instead of parts, look into Fenn Rotary Swaging. Write for catalog SM58.



FENN *Sets the Pace* IN ROTARY SWAGING

FENN MANUFACTURING COMPANY • 103 FENN ROAD, NEWINGTON, CONN.

pered serrated wedges. Available with either a No. 50 NS drive or a flatback drive for mounting on centering plugs, these cutters are 2 in. wide and are made to order with diameters ranging from 8 to 16 in.
Goddard & Goddard Co, 12280 Burt Rd, Detroit 23, Mich

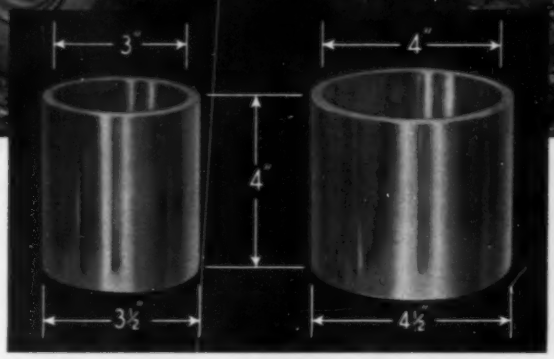
Epoxy glass base laminate, Phenolite Grade G-11-861, retains 70% to 80% of its original flexural strength when tested at 150 C after conditioning for one hour at that temperature. G-11 is also made as Copper Clad Phenolite Grade G-11-861-1 for printed circuit applications.
National Vulcanized Fibre Co, Box 511 Wilmington, Del

Turning and facing tool, Style KDG, uses Kendex throwaway turnover inserts with 80° nose angle. Tool is made in four sizes with separate shims and chipbreakers, eliminating the need for chipbreaker grinding.
Kennametal Inc, Latrobe, Penna

Motor-driven stock reel, Model ACR-1642, handles material up to 16 in. wide, ID's from 14½ to 22 in., max weight capacity of 2500 lb. Four cross-members expand and contract to suit the ID of the coil.
U S Tool Co, Inc, Ampere, NJ

Spray equipment, called Multi-Mister, for cooling and lubricating forming and cutting tools for metal and plastics supplies a fine mist of coolant liquids or light cutting oils at the point of contact between tool and material. Equipment consists of one or more adjustable tip spray nozzles and brackets for mounting; flexible tubing to carry air and coolant to each nozzle; and supply tank with

(Continued on page 144)



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SELF-LUBRICATING

BEARINGS

prove a match for top payloads on ATHEY Rear Dump Trailers

Oilite* Bronze Bearings have proven more than a match for the 22 and 34-ton payloads on Athey Rear Dump Trailers.

Oil-cushioned against shocks and impacts, these Oilite heavy-duty bearings have demonstrated that they will withstand years of punishment and still give satisfactory service. They require only infrequent lubrication and help Athey substantially increase the dependability of its hauling units. Yet, Oilite Bearings *cost less* than many other type bearings!

No wonder more and more designers are specifying popular Oilite self-lubricating Bearings for motor vehicles, appliances, engines, power tools, machinery and countless other products.

Contact your local Oilite Engineer today. He'll gladly provide complete design information to help you make your bearing and bushing applications low-cost, dependable and maintenance-free. Look for him in your telephone directory under "Bearings—OILITE" or write direct to Dept. I-6.

TYPICAL PROPERTIES OF SELF-LUBRICATING BRONZE OILITE BEARINGS †

Porosity, %	18-23
Ultimate Tensile Strength, (psi)	18,000
Compressive Strength (psi)	20,000
Elongation, % min. in 1"	10
Brinell Hardness	40

† Other materials and physical properties available.

* REGISTERED TRADEMARK
ONLY CHRYSLER MAKES OILITE

the most trusted name in powder metallurgy

SINCE 1939 — A CHRYSLER PRODUCT — OILITE

AMPLEX DIVISION

CHRYSLER CORPORATION, DETROIT 31, MICHIGAN

SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

See why Tool Engineers call these heavy producers,

"MOST MODERN MACHINES OF THEIR TYPE"

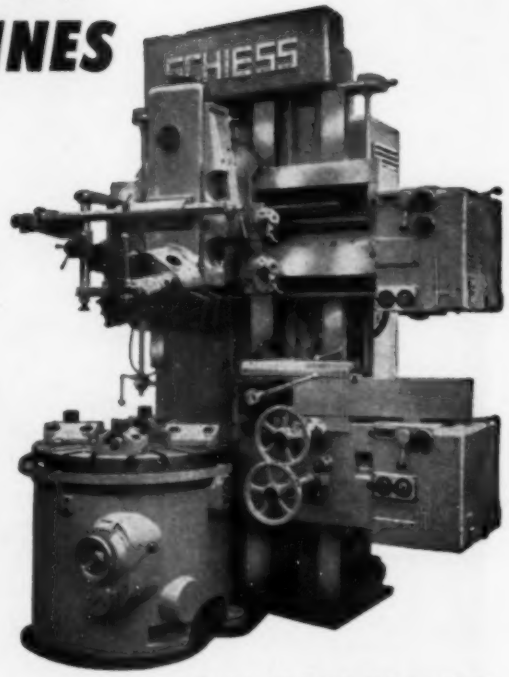
Hydraulic pre-selection of speeds set by handwheel and read on illuminated dial. 16 spindle speeds—ratio 1:50—up to 310 rpm for carbide machining on Model KE 100. Table runs on tapered roller bearings.

Fingertip control for direction of feed and rapid traverse with spring-loaded mono-levers for normal direction plus angular compound feeds. Mono-levers move in same direction as desired feed or traverse movement, simplify correct setting by operator. Specially designed electro-magnetic disc clutches disengage feed instantly with no over-riding or coasting.

Counterbalanced cross rail and side head. Single lever unlocks, raises or lowers, and locks cross rail simultaneously by electro-mechanical controls. *No bolts or nuts to loosen or tighten by hand.*

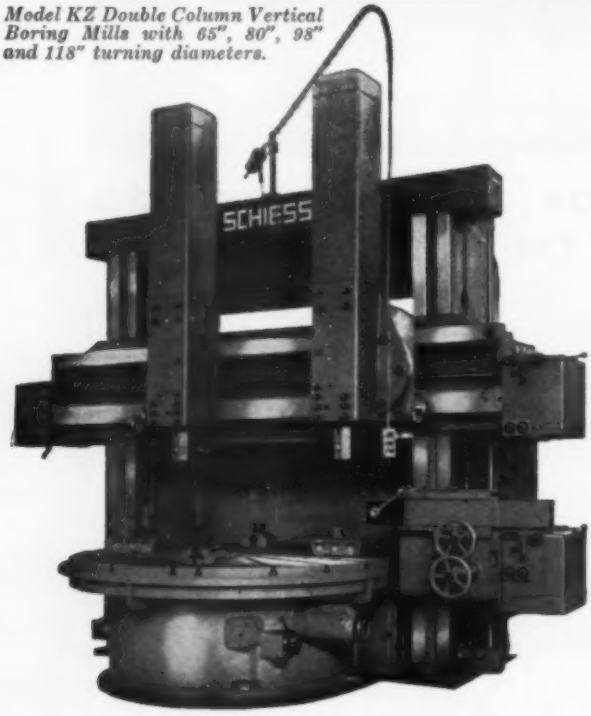
Magnetic dry particle clutch provides vibration-free drive for smooth surface finish. Power is transmitted via belt to clutch from main motor mounted on left side of machine. Instantaneous braking is assured by magnetic dry disc brake.

Copying attachment with electric tracer for use on cross rail or side head.



Model KE Single Column Vertical Turret Lathes with 40", 50" and 65" turning diameters for high-speed carbide machining.

Model KZ Double Column Vertical Boring Mills with 65", 80", 98" and 118" turning diameters.



All operating features of KE Series Vertical Turret Lathes are combined in

SCHIESS KZ DOUBLE COLUMN VERTICAL BORING MILLS, PLUS—

Heads equipped with steel octagon rams can be swiveled—have automatic feed in vertical, horizontal and angular direction and are independent of one another as to amounts and direction of feed. Table operated by three-button pendant control. Standard model KZ Double Column Vertical Boring Mills are available with 65", 80", 98" and 118" turning diameters.

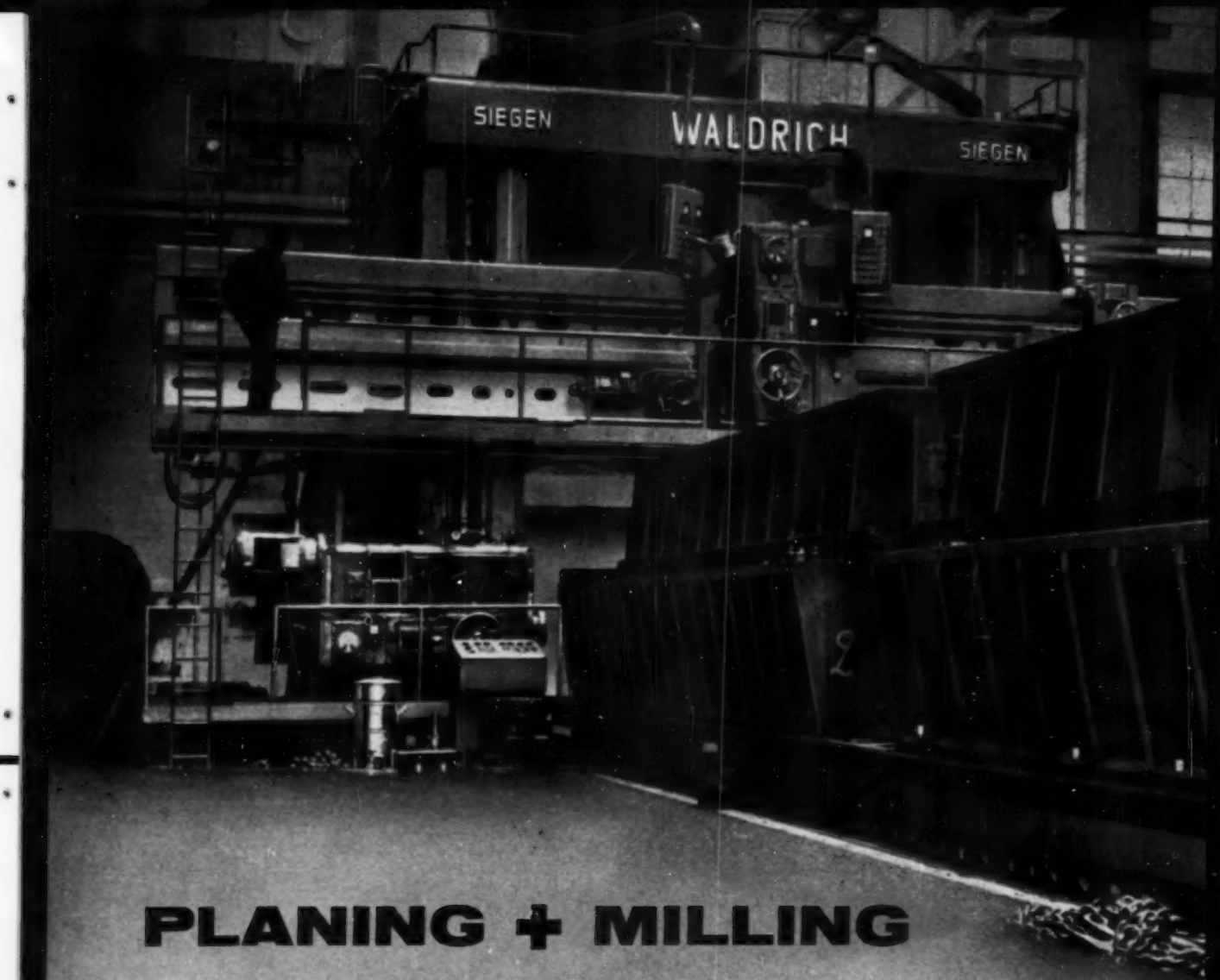
Get to know these products of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on these and all Schiess KE machines.

engineering division

SCHIESS

AMERICAN SCHIESS CORPORATION

1232 Penn Avenue, Pittsburgh 22, Pa.



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of Heavy Workpieces in one set-up . . . on one machine

- Reduces machining time
- Reduces set-up time
- Increases over-all accuracy
- Cuts manufacturing costs

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Waldrich Siegen combined planing and milling machines

WALDRICH SIEGEN

american waldrich mfg. corp.

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new

LIGHT weight

LOW HEADROOM

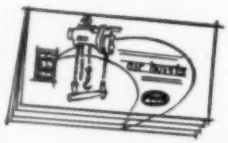
AIR HOISTS

Unequalled for tough jobs, these hoists are unaffected by hot, corrosive, or wet atmospheres and are explosion and shock proof.

They are available in two capacities. The ½-ton size weighs only 39 lbs., and the 1-ton size weighs only 55 lbs. Fully-loaded lifting speeds are 40 fpm and 20 fpm respectively, and both units are available with either link or roller chain.

Ask your Ingersoll-Rand AIR-engineer to demonstrate these new "light weight leaders" in the complete line of Ingersoll-Rand air hoists from 200 lbs. to 24,000 lbs. capacity. Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Send for free copy of new Lightweight Air Hoist Bulletin Form 5224.



Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-752

suction tube, strainer, and header to which tubing is attached.

DeVilbiss Co, 300 Phillips Ave, Toledo 1, Ohio

Electrolytic grinding spindles, motorized or independent drive, are now available to handle 1000 amps. The spindle nose will serve a variety of wheel holders for straight or recessed wheels. Other models available for 75, 100 and 350 amps.

Standard Electrical Tool Co, 2488 River Rd, Cincinnati 4, Ohio

Automatic die stop stops material just prior to piercing, shearing or blanking operation. Device is installed by simply drilling and reaming a hole in the proper location and then pressing the stop in position. It is actuated by an adjusting screw located in the top die shoe. Installation takes approx 20 min.

Keystone Engineering and Mfg Co, 122 SW 16 St, Des Moines, Iowa

Cutting tools recently added to company's line include two-flute, HSS single-end end mills for milling aluminum, and a variety of HSS wedge-type cutters. The latter tools include staggered tooth, half side mills, integral shank end mills, shell end mills and face mills.

O K Tool Co, Inc, Milford, NH

Parts feeder components, for the Syntron bowl-type feeders, are available for anyone who finds it expedient to develop his own parts-handling systems. Components include five standard drive units and

"Your pay envelope is bigger, Herdrix; however the money is the same!"

NOW—A LOW-COST LAPMASTER

Specifically Designed for Maintenance Lapping

new

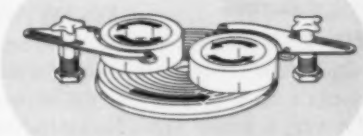
Lapmaster® MODEL 10

Saves Time and Money On:

VALVE SEATS • MECHANICAL SEALS
COMPRESSOR DISCS • DIESEL INJECTOR
AND OTHER MISCELLANEOUS PARTS

- Faster than old lapping methods.
- *Consistently* laps to flatness within .0000116" and micro-inch finishes of 2 to 3 RMS.
- Operator need not be experienced.
- Handles parts up to 7" diameter to meet all usual maintenance lapping needs.
- Will handle parts of any shape or form . . . any metal, ceramics or plastic.
- Automatically controlled lapping cycle.
- Size: 18" x 13" x 12". Weight: 133 lbs.
- Operates on any 110 volt—60 cycle—single phase outlet.

NO TIME LOST
in Reconditioning
Lap Plate with Exclusive
LAPMASTER PRINCIPLE



No down time for truing lap plate . . . conditioning rings automatically keep plate flat and true.

Lapmaster® . . . THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

WRITE FOR THE COMPLETE LAPMASTER STORY

Write for bulletins describing the Lapmaster line and chart on measuring flatness.

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6436 OAKTON ST. • MORTON GROVE, ILL. (Chicago Suburb)
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There's a BIG difference in floor absorbents

MAKE THIS DISCOVERY!

RIGHT IN YOUR OWN OFFICE you can test the difference of Eagle-Picher Industrial Floor-Dry with whatever oil absorbent you're now using. You'll discover it actually absorbs as much as 100% or more liquid per pound than other floor drying materials.

YOU'LL ALSO PROVE that Eagle-Picher Floor-Dry retains its skid-proof granular mineral form even when saturated. It doesn't mud or pack. Light in weight, it spreads easier and covers a larger area. Non-combustible, it has no chemical reaction. And possessing unusual reflective power, Floor-Dry makes working conditions bright and pleasant, as well as safe!

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WRITE TODAY. Our Eagle-Picher representative will bring the portable laboratory to your office where you may make this test yourself. The Eagle-Picher Company, Cincinnati 1, Ohio.

eleven standard sizes of cast aluminum or fabricated steel bowls. Bowls range from 5 to 36 in. dia; drives are designed to handle this entire range.
Syntron Co, 311 Lexington Ave, Homer City, Penna

Drives and couplings, designated 5D and 5C, are the latest additions to company's Flexidyne Dry Fluid drive and coupling line. They are designed for ¼, 1/3, ½ and ¾-hp motors at 1750 rpm, and are recommended for use with light machines subject to jam-ups or to enable small motors to handle heavy starting loads. Bulletin R-665 available.
Dodge Mfg Corp, Mishawaka, Ind

Radius turning attachment for the Derbyshire Model A lathe can turn concave and convex radii. An indicator is available, in either 0.001 or 0.0001 in. graduations (or in millimeters), to provide operator with fine adjustments.
F W Derbyshire, Inc, Waltham 54, Mass

Lift truck mast for company's Pug electric lift truck extends to max height of 135½ in. Retracted height is 69 in. Mast has three telescoping sections.
Hustler Corp, 17871 Elm St, Willoughby, Ohio

Air-operated chain hoist, 1000-lb capacity, weighs only 30 lb and raises half-ton loads at a rate of 50 fpm. Designated Model H-1000, the hoist is powered by a reversible 8-blade

"You keep trying to sell us on automation here when we ain't got animation yet."

air motor, and is capable of lowering rates up to 96 fpm. Sensitive throttle control permits accurate positioning. Unit is available with two types of throttle control—manual nylon rope and pendant or remote control. Bulletin 2367 available.

Thor Power Tool Co, Prudential Plaza, Chicago 1, Ill

Machine load indicator, called Tool-Gard, is a dual-purpose load measuring instrument for use on any machine tool. It gives constant visual tool wear indication or it can monitor machine tool overload or underload.

Futurmill, Inc, 6360 Highland Rd, Pontiac, Mich

Milling cutter line using ½- and ¾-in.-square throwaway carbide and HSS inserts has been added to company's line. Positive-rake, inserted-blade, shell end mills and face mills feature generous chip room and close anvil provides a hard, accurate, blade spacing to provide high feed rates. Replaceable, hardened HSS anvil provides a hard, accurate ground seat for the insert. Bulletin 121657C available.

Viking Tool Co, 1000 Nichols Rd, P O Box 471, Shelton, Conn

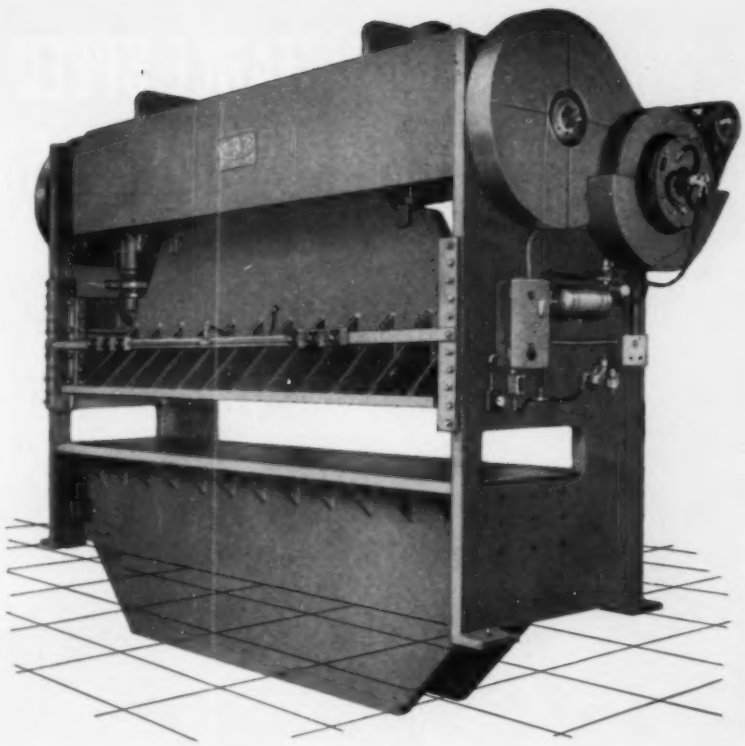
Arc time meter, tradenamed Arc-Timer, accurately records the duration of arc of any welding machine, ac or dc, whose open circuit voltage does not exceed 110 volts. Meter is cumulative so that arc operation between 15 and 45 volts may be recorded by job, hour, week or any prescribed period. Unit plugs into any 110-v circuit. It measures 6 x 5 x 4 in. and sells for $99 fob factory.

Machinery & Welder Corp, 700 S Spring Ave, St Louis 10, Mo

Lift tables are available in three sizes—48 x 24, 52 x 30, and 72 x 42 in. They are designed to lift 2000, 4000 and 6000 lb to heights of 30, 36, and 48 in., respectively, in less than 30 sec. Unit folds to a height of 7 in. Table top is one-piece heavy steel plate. Power is furnished by motor through a heavy-duty hydraulic cylinder.

Clark-Aiken Co, Lee, Mass

Bright welding wire, King Brand, is available in a broad range of alloys for MIG (metal inert gas) aluminum welding processes. It is furnished in one and ten-pound spools in diameters from 0.020 to ⅛ in. Bright surface 5183 alloy welding wire, also new, is the first to meet the ultra-high strength welding requirements



CHICAGO DREIS & KRUMP

PRESSES

STRAIGHT-SIDE TYPE

large die area

capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

8674

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies

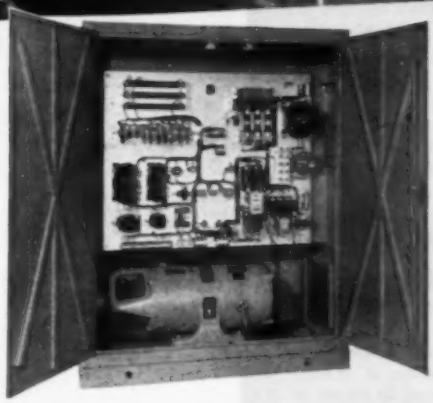
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.

7434 South Loomis Boulevard, Chicago 36, Illinois

Which Type ADJUSTABLE SPEED DRIVE CONTROL Do You Need? SQUARE D BUILDS BOTH!

Typical application of Adjustable Voltage Drive to large metal spinning lathe in operation at Phoenix Products Company, Milwaukee



ADJUSTABLE VOLTAGE CONTROL FOR M-G SETS...Through 400 HP

Simplified Circuits with rugged heavy-duty control components.

Easy Maintenance because standard magnetic starters, relays and timers are used in combination with static regulators.

3 Types Available • (*1*) magnetic amplifier exciters (*2*) dry disc exciters (*3*) rotating exciters.

Easy to Adjust because centralized "tune-up" elements are accessible and readily identified.

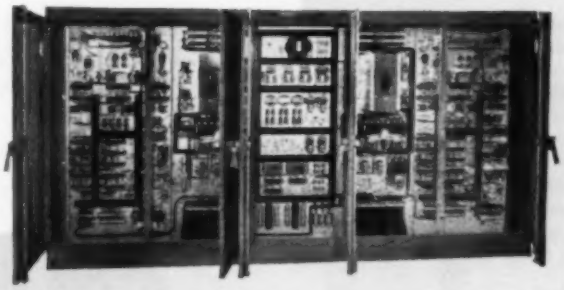
FULLY ELECTRONIC with SIMPLIFIED FAIL-SAFE CIRCUITS THROUGHOUT

Simplified Circuits use less tubes. Fail-safe circuits prevent motor runaways.

Easy Maintenance because sub-panels can be quickly removed and replaced. "Brain" panel senses varying conditions.

Easy to Adjust with only a few, very accessible potentiometers.

Both types are available in two kinds of construction—standard package and custom-built.



Write for descriptive literature. Address Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

of Kaiser's 5083 alloy sheet and plate. Electrodes for TIG (tungsten inert gas) welding processes are available in 36-in. straight lengths in the same alloys as spooled wire, diameters ranging from 1/16 to 1/4 in.

Kaiser Aluminum & Chemical Sales, Inc, 919 N Michigan Ave, Chicago 11, Ill

Huckbolt fasteners fabricated from high alloy die steels and a variety of stainless steels are designed for use in new missile programs. They are recommended for use at high temperatures when high strength is required. Among the materials that may be specified are AISI Types 321 and 431 stainless, A286 and 17-4 PH stainless, Vasco-Jet 1000 alloy steel and Thermold J alloy steel.

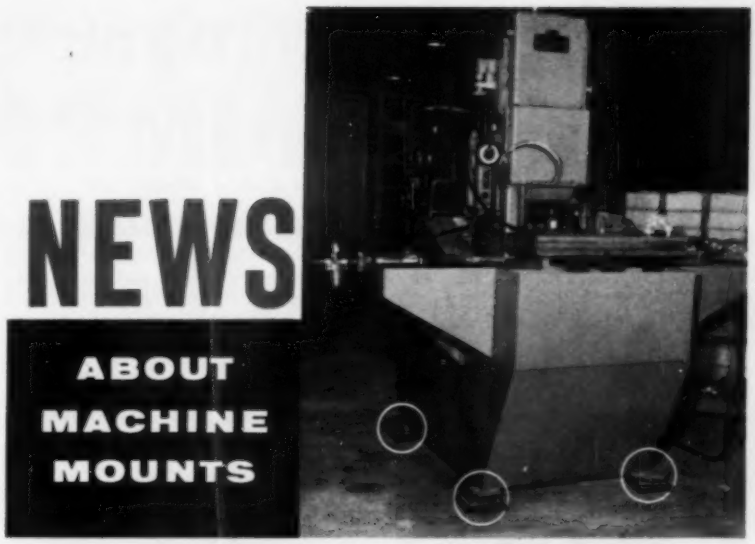
Huck Mfg Co, 2480 Bellevue Ave, Detroit 7, Mich

Continuous threaded rod is the latest addition to company's line of toolroom specialties. It is available in a wide range of sizes and lengths, and may be had in steel and other metals. Literature available.

Precision Steel Warehouse, Inc, Mfg Div, 421 Maple Ave, Downers Grove, Ill

Cylindrical OD grinding attachment, in addition to using true dead centers which assure concentricity to 0.0001 TIR, can also serve as an inspection instrument. Features include built-in sine plate and micrometer that permits grinding and inspection of tapers within seconds of an arc; spring loaded tailstock centers; and a micrometer range from 0.025 minus to 0.025 plus which eliminates need for set of gage

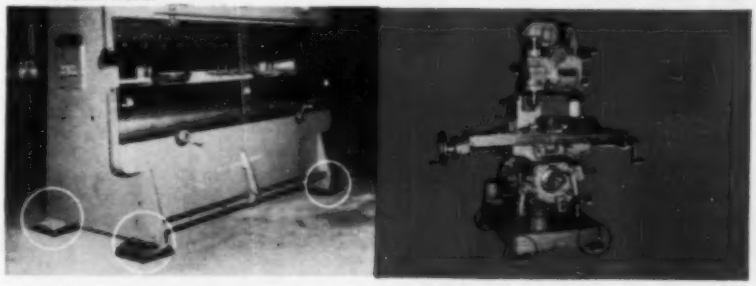
"No one seems to trust Wilbur. One card's for the company and the other one's for his wife."



"UNISORB IS COST-SAVING, SIMPLE, FLEXIBLE MACHINERY MOUNT"

SAYS AUTOMATIC TIMING & CONTROLS, INC.

Automatic Timing & Controls, Inc., King of Prussia, Pa., has made extensive use of Unisorb for installing production machinery, examples of which are shown here.

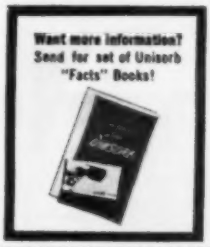


Unisorb provides ATC with three important advantages: 1. Eliminates scarred and pitted floors, 2. Installations made simply and cheaply, and 3. Machinery is secure but can be easily moved.

Try Unisorb on Special Trial Offer! Install just one machine and you'll be convinced — if not return the pads and we'll credit your invoice. Call or write today.

UNISORB 200 SOUTH ST. BOSTON 11, MASS.

Division of The FELTERS Company



Please send me a set of Unisorb "Facts" Books and trial offer request.

Company.....

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UNIVERSAL JOINTS

They are made to provide smooth, more efficient transmission of power and are available from stock in 13 sizes with bored or solid hubs ranging from .375" to 4.000". Special bores, bores with keyways or setscrews are available upon special order.

The close limits to which all parts are held assure maximum load carrying capacity with durability and long life. Joints with hub diameters of .750" and larger have a self-closing snap ball oiler while the small pin is held in place with a self-locking snap ring. The snap ring simplifies assembly and disassembly.

Send today for Bulletin No. 527 describing the full line of ASG Universal Joints available from your nearest distributor.

AMERICAN STOCK GEAR DIVISION
PERFECTION GEAR COMPANY
HARVEY, ILLINOIS, U.S.A.

blocks. A 24-division index plate permits work to be indexed within seconds of an arc.

Gebhart Machine Tools, Ltd, 1608 Victory Blvd, Glendale, Calif

Hard-surfacing electrode, Inco-Hard 1, provides a hard surface overlay for low-alloy steels and cast irons where severe abrasive conditions are present. The deposit is structurally similar to Ni-Hard nickel-chromium alloy. Electrode is available in diameters of 5/32, 3/16 and 1/4 in.

International Nickel Co, 67 Wall St, New York 5, NY

Electrodes, Easyarc 308, 316, and 347, are reportedly the first powdered metal stainless electrodes ever offered. Features of the ac-dc units are described as: unprecedented footage per electrode; well formed beads; and excellent restriking characteristics.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

Lift truck channels designed for a 10,000-lb capacity Yale gasoline truck can raise a 4000-lb load to a height of 30 ft (over-all collapsed height is 220 in.). Lifting speeds of 20 fpm loaded and 21 fpm empty are possible.

Yale & Towne Manufacturing Co, Materials Handling Div, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

Flame cutting machine (German) is controlled directly by 60 x 150 mm photographic glass negatives made from drawings. All preparatory work is done in the drafting room; plates and related negatives come directly

"That time clock gives you some idea how modern this plant is!"

STERLING "G-2"
with 25° Tilting Spindle
for *FAST, ACCURATE*
Tool and Cutter Grinding

STERLING "G-2" UNIVERSAL Available in PLAIN Model also

Compare Construction . . . Capacity . . . Features . . . Cost!

The STERLING 25° Tilting Spindle takes guess work out of setting clearance angles, makes set-up changes simpler and insures accurate grinding. Extra capacity and versatility make the STERLING "G-2" an outstanding Tool & Cutter Grinder. Available in Plain and Universal Models.

Sharpen Drills 1/8" to 2 1/2", 90° to 140° included angle, on ONE Drill Grinder

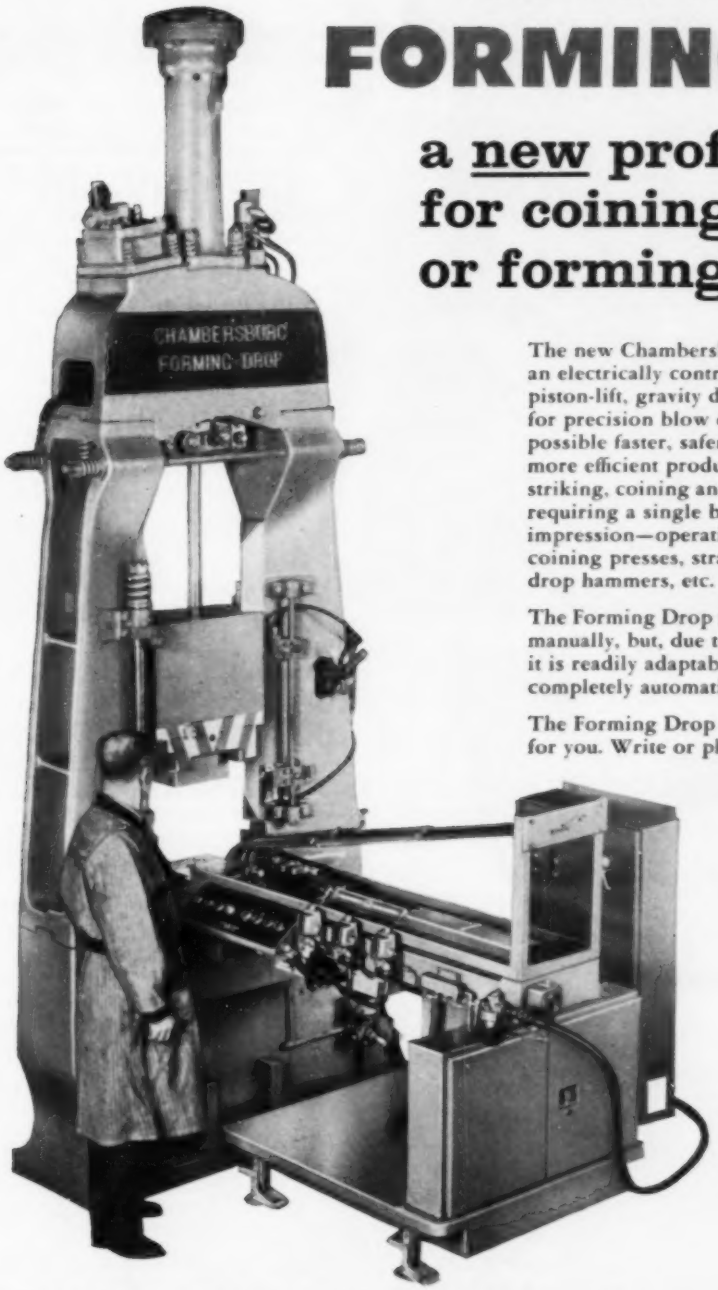
The STERLING "DV" grinds drill lips equally, with accurate, pre-determined clearance angle and included angle. True conical grind produces free cutting drill that drills more accurate holes per sharpening.

For complete information see your McDONOUGH Dealer or write direct for Bulletin DV-1.

McDONOUGH MANUFACTURING CO.
152 GALLOWAY • EAU CLAIRE, WISC

CHAMBERSBURG
FORMING DROP

a <u>new</u> profit maker for coining, embossing or forming operations



The new Chambersburg Forming Drop is an electrically controlled, air-operated, piston-lift, gravity drop hammer, designed for precision blow control. It makes possible faster, safer, almost effortless, more efficient production on forming, cold striking, coining and embossing operations requiring a single blow in a single die impression—operations common to coining presses, strap hammers, pneumatic drop hammers, etc.

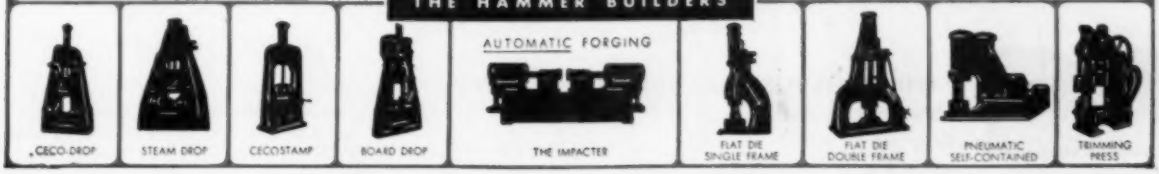
The Forming Drop may be fed and operated manually, but, due to its electrical control, it is readily adaptable to semi-automatic or completely automatic operation.

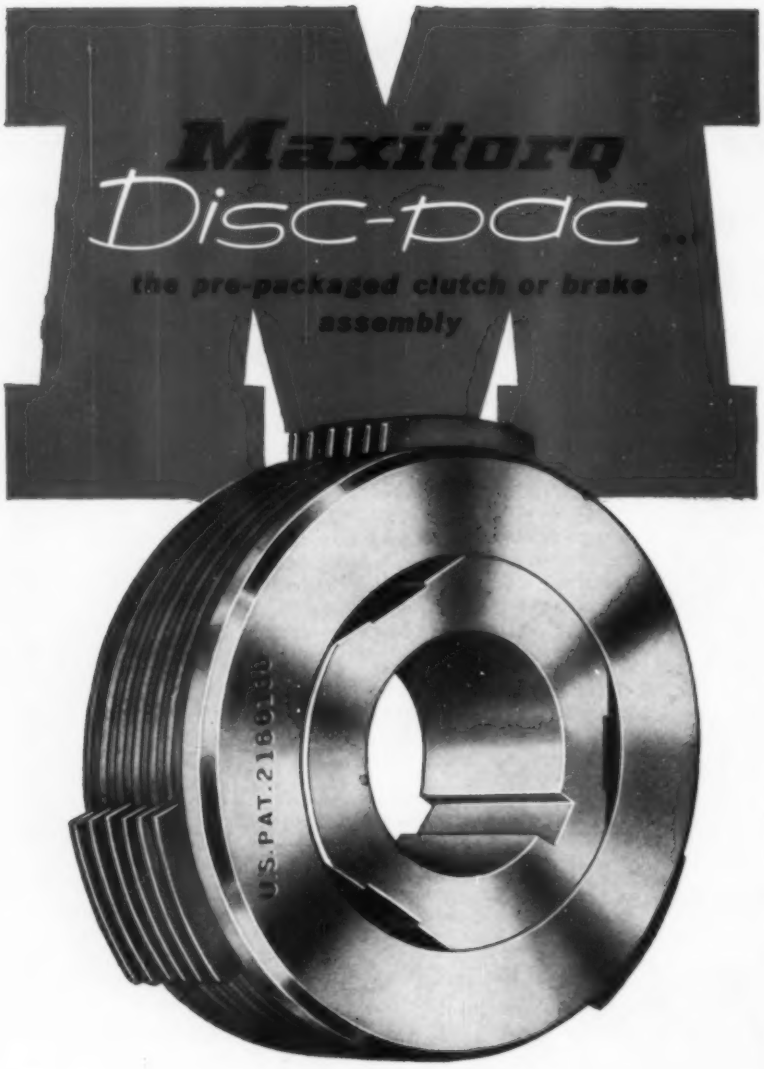
The Forming Drop may hold possibilities for you. Write or phone for further details.

CHAMBERSBURG ENGINEERING COMPANY . . . . . CHAMBERSBURG, PA.

CHAMBERSBURG

THE HAMMER BUILDERS





Takes performance guesswork out of power transmission design

With these performance-proved units, you can save time and money in designing and building clutches and brakes exactly tailored to the requirements of your application. At the same time, you can be sure that they will equal the performance and smooth operation of proved MAXITORQ clutches and brakes. DISC-PACS are simply the "heart" of a clutch or brake . . . the discs, separator springs, and locking plate . . . supplied as a complete self-contained unit for the convenience of design engineers and equipment builders.

Produced in a full range of sizes and capacities from ¼ h.p. to 15 h.p. Bulletins available on other MAXITORQ products: Floating Disc clutches and brakes, Electric clutches, Overload Release clutches, low-cost Single Disc clutches, and clutch or brake friction discs. Write Dept. AM-6.

THE CARLYLE JOHNSON MACHINE CO.
Manchester, Connecticut

1C-378

to the flame cutter. There is no other templet preparation or plate layout. Machine uses standard American tips. Tolerances of 0.040 to 0.060 in. in 32 ft are regularly maintained.

Distributed by Hudson Equipment Co, 515 Madison Ave, New York 22, NY

Pre-plated steel is available in a low-cost utility grade, called C-grade steel base, in finishes of chrome, nickel and copper. Product is furnished in sheets, 24 x 96 in. and up to 160 in.; coils, ⅛ to 24 in. wide; flat strips, ¼ in. or wider up to 96 in. long. Gages, 0.008 to 0.036 in.; temper, No. 4.

American Nickeloid Co, Peru, Ill

Drillpress vise, Model X4V, has swivel handle, machined slide ways, four holddown feet for easy mounting. Width of jaws is 4 in.; depth, 2 in.; opening, 7 in. Base size over-all, 6¼ x 11⅛ in.

Alva Allen Industries, Machine Tool Div, Clinton, Mo

Coolant supply system, designed for deep hole drilling (gun drills) and trepanning, is being manufactured in three standard sizes: 7.5, 22.5, 37.5 gpm with pressures up to 1000 psi. Unit guarantees removal of all particles larger than 5 microns.

Cardwell Machine Co, Franklin & 19th St, Richmond 11, Va

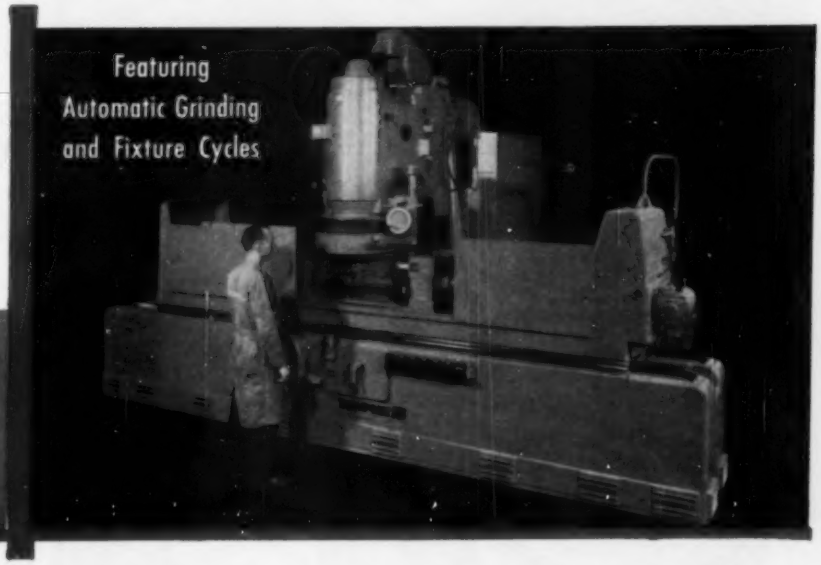
Temperature monitor and control, Pyrotrol, can be used with induction heaters, crucibles, gas flame or torch, or furnaces. It operates at a distance, from 6 in. up to many feet away. Optical system points at the work, focuses the infra-red radiation which

"Boy do I hate to argue with that guy . . . just when you think you're winning he either changes the subject or walks away . . ."

THOMPSON handles the toughest production jobs... *fast and accurately...*

with

THE VERTICAL SPINDLE SURFACE GRINDER



SPECIFICATIONS

Size: 18" x 18" x 62"
Wheel: 22" Segmental
Production: 30 blocks per hour
Total Stock Removal: .010"

Shown above is the latest Thompson vertical spindle machine grinding the diesel engine cylinder blocks of a leading truck manufacturer. To meet the demand for fast, continuous production, both the fixture and grinding cycles are automatic and are interlocked to prevent accident. A separate hydraulic power source operates the single place fixture which locates the cylinder block on the main bearing holes.

Since any variations in stock removal would affect the compression ratio of the engines, constant accuracy is controlled throughout the grinding cycle. The operator merely sets wheel contact with the work and automatic operation begins.

Thompson vertical spindle surface grinders are made in various types and sizes to meet all job requirements. All machines of 40 inches and up in work length are equipped with the Hydra-Cool Hydraulic System*—the exclusive Thompson feature that eliminates all heat distortion throughout the machine.

*Pat. Applied For.

MACHINE CYCLE (Total Stock Removal .010")

CYCLE I

- Load work piece into fixture and start table cycle.
- * Manually lower grinding wheel to contact work piece.
- Automatic downfeed of wheel occurs at each table reverse to remove .010" stock.
- Spark out to final size with table moving to start position.
- * Manually elevate grinding wheel to starting position and release work piece in fixture.
- Table automatically stops.

**Can be furnished as automatic functions.*

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER CO.
SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

HOW MASS PRODUCERS

Eliminate Costly, Unnecessary Metalworking Operations . . .

and produce a better product!

7 station die ribbon for Grinnell sprinkler head. Note: piercing, marking, blanking and forming in one press operation. Stock: .065 brass. Production: 72 pieces per minute.

With B. Jahn designed and engineered progressive dies, mass producers eliminate unnecessary press operations, marking operations, parts handling, intermediate inspection.

Part uniformity, product quality, production savings and profit improvement are all advantages which result in a better end product at an economical mass production price!

Progressive Mass Producers save with B. Jahn Progressive Dies!

B. Jahn

Send today for colorful 20 page "CASE HISTORY" Brochure!

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

it emits upon a photocell whose output signal is amplified, triggering an electronic relay which can shut off a heater, sound an alarm, or perform other tasks. Standard operating range is 950 to 2000 F.

Mason Instrument Co, 29 Elm Ave, Mount Vernon, NY

Brake shoe grinder, Model B-75B Radius Grinder, is now being preset at the factory to automatically undersize grind brake shoes to properly fit the brake drums in which they are to operate. Operator simply measures the drum diameter, sets the grinder for this diameter, and grinds the shoes. No calculations are necessary.

Barrett Equipment Co, 2101 Cass Ave, St Louis 6, Mo

Silver clad stainless steel can be used as an inexpensive, durable electrical contact material. It is supplied as a cladding on one or both sides of a stainless base, or as an inlay in the base, or as a strip on the edge of the base.

American Silver Co, 36-07 Prince St, Flushing 54, NY

Fastener, dart-type Speed Clip made from heat-treated spring steel, has been developed for retaining printed circuit panels to radio and television chassis. It not only retains circuit boards to panels, but provides a positive electrical ground at points where it is inserted around the circuitry.

Tinnerman Products, Inc, Cleveland 1, Ohio

Adhesive designated No. 387 Rubbaweld has been developed for bonding polyethylene linings to steel tanks and other surfaces. The self-

"The boss likes the terms of our contract so much he decided to work in the shop himself."

vulcanizing material eliminates need for application of primers to either the metal or polyethylene. Adhesive will withstand temps of 350 F and does not become brittle when cold.

Rubba, Inc, 1015 E 173rd St, New York 60, NY

Fire extinguishers containing dry chemical powder for Class B and Class C fires are available in 20 and 30-lb pressurized heavy-duty models. A 15-20-ft stream of the powder can be delivered over a 60° arc.

Pyrene-C-O-Two Division, Fyr-Fyter Co, Box 750, Newark 1, NJ

Elbolift electric lift truck (*AM*—Sept 23 '57, p189) now incorporates a side shifting fork and load carrying ram arrangement. Hydraulically controlled feature (optional) enables operator to side shift load 4 in. to either side of truck, or to bring forks together at truck's center line to form a load carrying ram.

Automatic Transportation Co, Div of Yale & Towne Manufacturing Co, 149 W 87th St, Chicago 20, Ill

Bearing Blue Compound locates the high spots for hand scraping or fitting of all bearings and surfaces. Ability to transfer from gage to surfaces being tested has been improved. Sample is available when requested on company letterhead.

Dayton Rogers Manufacturing Co, 2824 13th Ave S, Minneapolis 7, Minn

Aerator coolant nozzle, Full-Flo, is furnished assembled to a flexible, all-metal wire braided armor hose that may be bent to any desired position for lubricating or cooling of work. A ⅜-in. NPT solid male coupling is furnished on machine end of assembly. Assemblies are suppiled in standard 9, 12, and 15-in. over-all lengths.

Universal Metal Hose Co, 2135 S Kedzie Ave, Chicago 23, Ill

Radial ball bearings suitable for operation in ambient temps up to 900 F are available from stock in sizes 200, 202, 204, and 206. Bearings are manufactured to ABEC 3 and 5 accuracy and operate at speeds up to 40,000 rpm without lubrication.

Industrial Tectonics, Inc, 3686 Jackson Rd, Ann Arbor, Mich

Lathe carriage stop is designed to provide positive cutting depth control for small and medium lathes in any of 6 pre-selected positions. Unit's 6 threaded stops provide more posi-

6 CENTS PER DAY BUYS A LO-HED® HOIST

"Although this hoist is over 32 years old, it is still doing an excellent job. Cost of maintenance is next to nothing. A recent inspection would seem to indicate that the hoist will be good for another 32 years."

Said by John Vengoechea, Maintenance Superintendent, Edgcomb Steel Company, Philadelphia, Pennsylvania, (seen on the left above, talking to Ed Boyer, Sales Manager, A-E's Materials Handling Division.

Lo-Hed Electric Hoists Cost Less Because They Last Longer

Based on current prices, this Lo-Hed Hoist at Edgcomb Steel shows a capital cost of less than 6 cents per day... and it looks like it will still be going strong in 1990.

There's A Lo-Hed Electric Hoist Exactly Right For Your Application

Just give us the details! Lo-Hed's are available with headrooms as low as 11"; capacities ¼ to 12 ton; all control types, two-speed included; 5 suspensions; also adaptable to any crane or monorail system; shrouded bottom block; 2 automatic brakes, anti-friction bearings throughout, full load tested. Look in your classified telephone directory under "A-E Lo-Hed Hoists" for your nearest representative.

For helpful information on hoists, fill out and mail this coupon today.

Please send me a copy of your booklet on:

☐ "How to select the proper hoist to meet your needs."

☐ "Five things to consider before you buy that hoist."

Name.....

Position.....

Company.....

Address.....

City..... Zone ... State.....

(H171)

DISTRIBUTORS AND AGENTS: Distributorships and agencies for Lo-Hed Electric Hoists are available in many parts of the country. If you are interested, call or write Ed Boyer, Sales Manager, A-E's Materials Handling Division.

AMERICAN ENGINEERING COMPANY

Wheatsheaf Lane and Sepviva Street

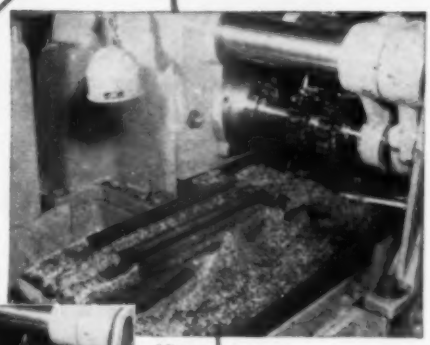
Philadelphia 37, Pennsylvania

Branch Offices: Jersey City • Cleveland • Chicago

Canadian Subsidiaries: Affiliated Engineering Corporations, Ltd., Montreal, P.Q. • Bawden Industries Ltd., Toronto, Ontario

AE Products are: Taylor, Perfect Spread and Vibra-Grate Stokers, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers, Marine Deck Auxiliaries

when milling costs run high...



After

During

Before

SWITCH TO WALKER PERMANENT MAGNETIC CHUCKS

No. 618

High milling costs are often caused by complicated, time-consuming set-up operations. O. S. Walker permanent magnetic chucks* are currently being used successfully for high speed gang milling operations. The "before, during and after" illustrations show how one manufacturer is saving time and money. Even at modern feeds and speeds, Walker permanent magnetic chucks hold the work securely. When the operation is completed, only a thin section of metal remains on the bottom of the work piece, making mechanical holding a difficult and complex process. Note the absence of chips on the cutter, due to automatic demagnetization.

Walker permanent magnetic chucks save you money three ways:

- Low initial cost because of the absence of expensive electrical equipment and mechanical fixtures.
- Low operating and maintenance costs.
- Low production costs because of reduced set-up time.

With Walker chucks you are sure of work flatness and parallelism because of designed-in dimensional stability assured by solid silver brazed construction. (For milling applications, a bottom plate with key slots is recommended). *Patent Applied for

Call your machinery dealer or O. S. Walker Company, Inc., Worcester 6, Mass. . . . Start saving money today. Write for catalog.

O. S. WALKER COMPANY, INC.
WORCESTER 6, MASSACHUSETTS, U. S. A.
The Original Designers and Builders of Magnetic Chucks

tive and accurate control over length of lathe travel. New turret is said to permit immediate and precision selection of any of the pre-selected stop distances. Model attaches to the bed of 90° V-way American or foreign lathes; an adaptor is furnished on request for other types of beds. Bed indicator gage is also available as an accessory.

G/K Products, 9548 Gidley St, Rosemead 2, Calif

"Triple-Angle" TM triangle utilizes the functions of three triangles. Features include 45/90° and 30/60° angles, and built-in slot lettering guides for ⅛, ¼, 3/16, and ⅜-in. lettering.

Alvin & Co, Inc, Windsor, Conn

Incandescent lamp, designated Kold, has adjustable flexible arm. Unit extends from a minimum of 12-in. to a max of 38 in. Outside shade remains cold to the touch even after continuous burning of a 75w bulb. Eight types in both fluorescent and incandescent models are available.

Faries Lamp Division, Elwood, Ind

Hydraulic cylinder called the T-J Spacemaker High Pressure Hydraulic operates at pressures of 1000, 2000, and 3000 psi. Features described in catalog HSM-5-58.

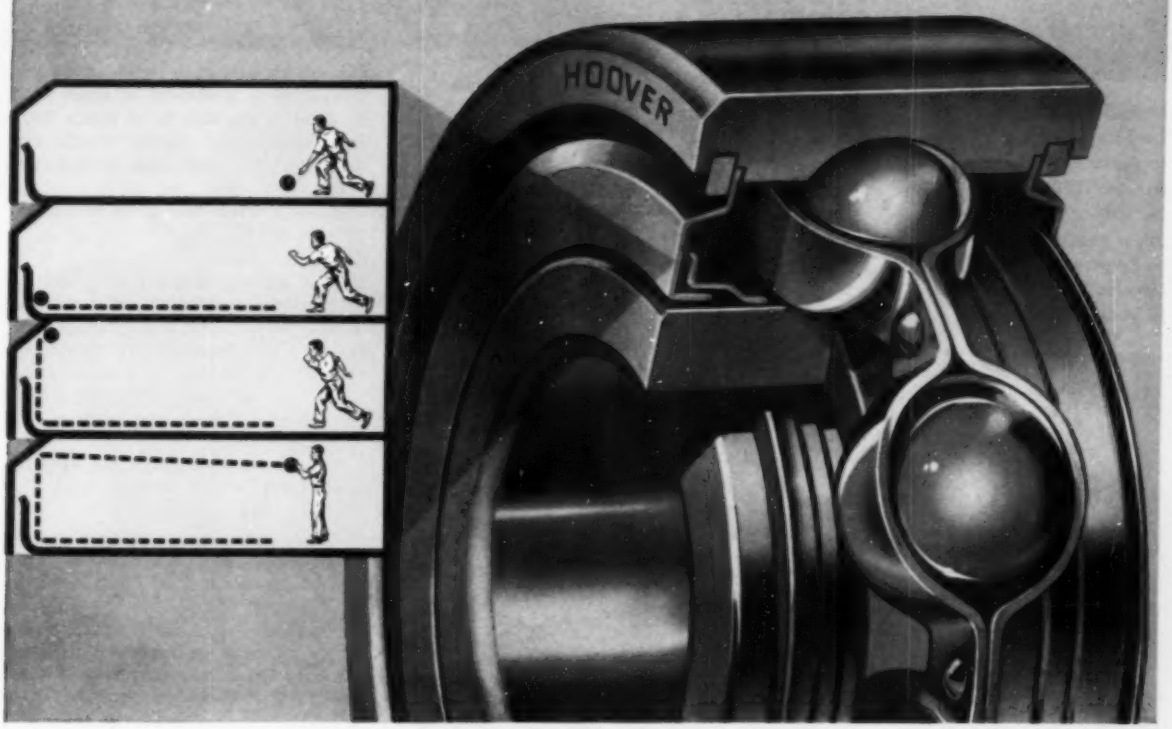
Tomkins-Johnson Co, Jackson, Mich

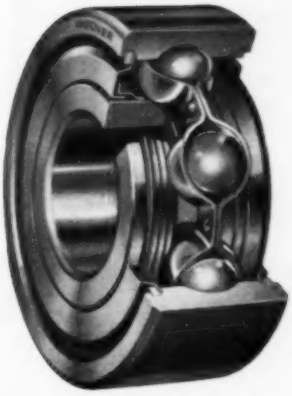
Testing machine, Cal-Tester, designed for operation in horizontal position, has now been modified for vertical use also, either with testing area in an up or down position. Machine and gages are

"What do you mean you're working on an air gage? Who cares how much air is in a shop?"

"Slinger Action" Circulates Locked-In Lube

in hoover cartridge bearings with dual labyrinth seals





Depend on Hoover to design a bearing that not only carries a lifetime supply of factory-selected, sealed-in lube, but also circulates the lube so effectively that maximum performance is assured for years. Hoover Dual Labyrinth Seals utilize centrifugal force to return lube again and again to the working surfaces. There is no chance for dirt to enter the bearing. Standard double row bearing width design assures extra large lube capacity. Standard bore and outside diameters simplify installation and replacement problems. Shields are easily removed for relubrication or servicing if required.

Hoover Cartridge Bearings are precision made with super smooth *Hoover Honed* Raceways and *Micro-Velvet* Balls, assuring high load capacity, smooth performance, hushed quietness.

Hoover Honed and *Micro-Velvet* are Hoover Trademarks.

hoover

BALL AND BEARING COMPANY

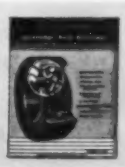
ANN ARBOR, MICHIGAN

LOS ANGELES SALES OFFICE AND WAREHOUSE: 2020 SOUTH FIGUEROA, LOS ANGELES 7, CALIFORNIA

AM-6

Hoover Ball and Bearing Company
Ann Arbor, Michigan

Please send your new Bulletin 104, giving complete information on Hoover Cartridge Bearings.



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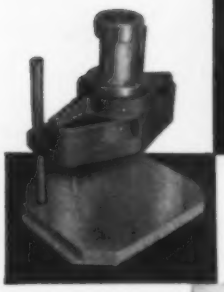
Title_____

Company_____

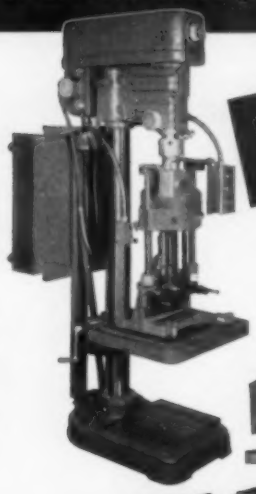
Address_____

City_____ Zone____ State_____



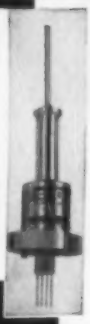
MANY Drilling and Tapping Heads **ARE BETTER THAN ONE!**

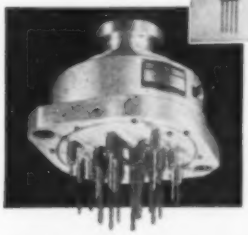
. . . let ZAGAR solve your problems



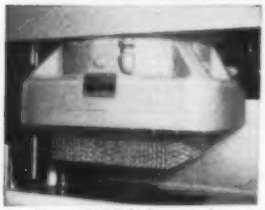
On your equipment

HOLES—any number, any pattern, any material, on ALL CENTERS can be drilled, reamed, or tapped with a Zagar head. Several shapes to fit your job.

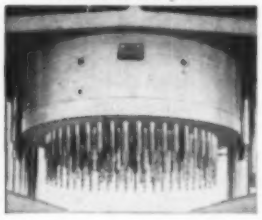




As a completely tooled package



Up to 1200 holes can be drilled at one pass.



As special machinery

Simultaneous spindle rotation for single-pass drilling, reaming, or tapping assures highest piece per hour production. The Zagar method is also profitable on intermittent, low production runs. Centers as close as sum of hole diameters is standard practice. Capacity up to 1½" hole diameter. Your print will bring a prompt quotation.

Ask for Data Sheet "A-6" containing detailed engineering information.

Zagar ZAGAR, INCORPORATED
23886 LAKELAND BLVD.
CLEVELAND 23, OHIO

TOOLS FOR INDUSTRY and SPECIAL MACHINERY

NEW SHOP EQUIPMENT

mounted on a portable stand and can be detached for horizontal operation. Arrangement provides greater possibilities for making tensile, compression, and flexure tests on metallic and non-metallic materials.

Cal-Testing Machine Co, 2735 S Robert Blvd, Los Angeles 34, Calif

Fixture clamps with hand knobs are furnished in a variety of sizes with ¼, 5/16, ⅜, ½, and ⅝-in. studs. Several lengths of clamp straps are available for each size except the ¼-in.

Harco Engineering, 12092 Woodbine, Detroit, Mich

Silicon plating rectifier with ability to operate in ambient temperatures of over 200 F, and high voltage rating, can be adapted for a variety of controls, depending upon application setup. It includes a class B transformer and is equipped with a coil for each cell.

Wagner Brothers Inc, Equipment Division, 7800 Dix Rd, Detroit, Mich

Cam-type die head is offered in two sizes: No. 44, ⅛ to ¾-in. pipe, ¼ to 1⅛-in. bolt; and No. 66, 1 to 2-in. pipe and 1¼ to 2-in. bolt. Both models are fully adjustable to cut oversize, undersize, or standard threads.

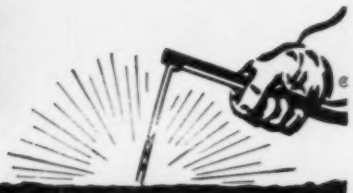
Toledo Pipe Threading Machine Co, 1445 Summit St, Toledo 4, Ohio

Cage-type needle roller bearing, Cagerol, is offered in two standard stock sizes. Interchangeable dimensionally with heavy-duty needle

(Continued on page 162)

"You're the foreman?—not quite what I pictured from one of your men's description."

Weldynamics*



*** ARC WELDING AT WORK CUTTING COSTS**

HOW YOUR NEXT JOB WILL BE HANDLED FOR LESS COST

For lowest cost, Weldynamics indicates that both AC & DC welding currents are needed to take full advantage of today's high-speed electrodes. One machine, Idealarc, fills this need . . . does the work of two welders. As a result, you need fewer machines, work scheduling is simplified, there are fewer machines standing idle.

Lincoln men, trained in Weldynamics, will show you how to apply these cost cutting advantages to your specific jobs—with the latest methods and electrodes available today.

Idealarc 180, 250, 300, 400 and 500 amp sizes. Available as AC or AC/DC welder. Can be purchased with AC only, adding DC later. Operates on single phase power. Write for Bulletins SB-1364 and SB-1343.

The World's Largest Manufacturer of Arc Welding Equipment

LINCOLN

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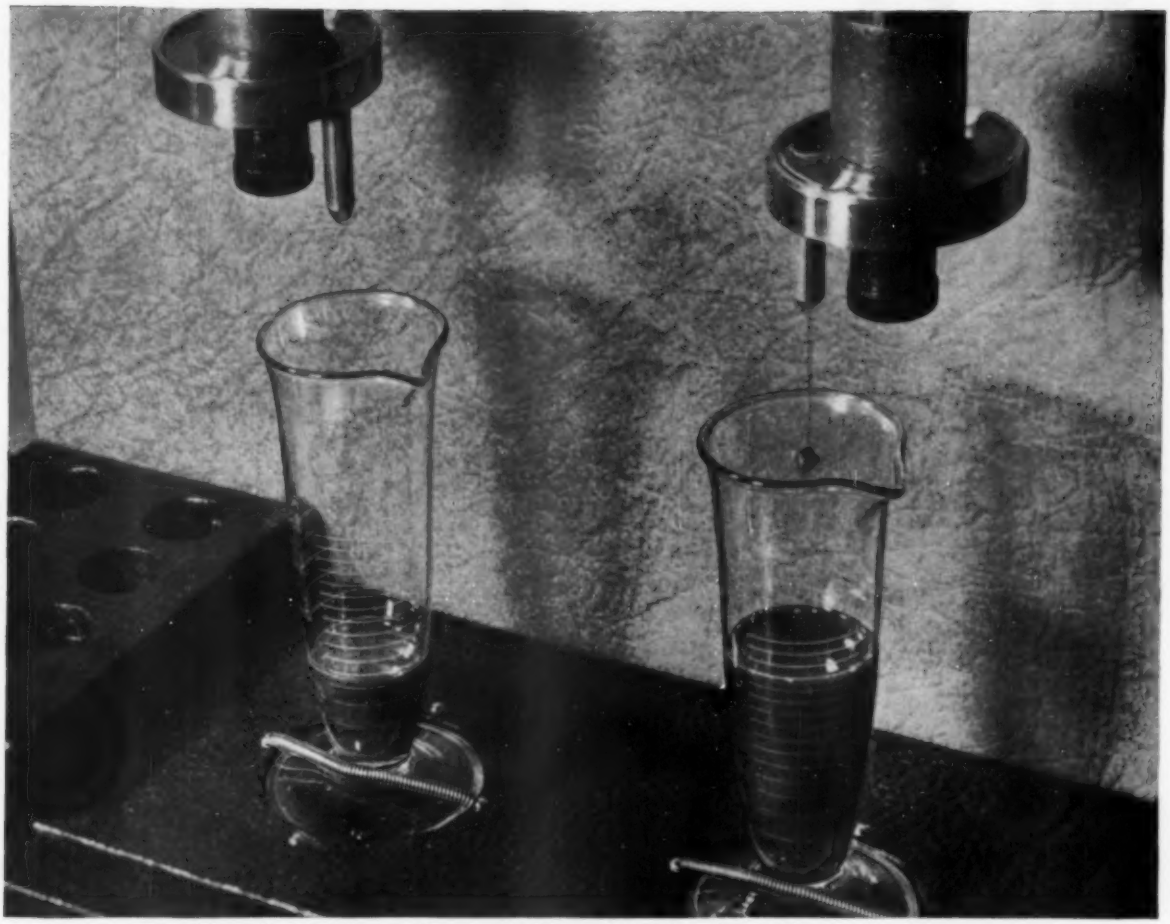
THE LINCOLN ELECTRIC COMPANY, DEPT. 2026, CLEVELAND 17, OHIO



The oils collecting in these graduates are being forced, at 100 psi, through two sintered bronze bearings. Although each oil has the same viscosity, the Suntac on the left is leaking *only one quarter as much as* the straight oil on the right.

Desk-top demonstration proves that SUNTAC HYDRAULIC OILS can cut your oil losses . . . up to 75%

Suntac® oils are competitive in price, competitive in quality, *and unique in their ability to reduce oil leakage without costly shutdowns.*

Suntac oils are high-quality, exceptionally stable mineral oils especially compounded to reduce leakage. Experience proves that they give longer pump and seal life with higher overall operating efficiency.

See for yourself how a Suntac oil can cut your oil costs. A simple desk-top demonstration will show you how.

Ask your Sun man to show you how others have reduced oil consumption, or write to Dept. AM-6.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

SUNOCO

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In Canada: Sun Oil Company Limited, Toronto and Montreal

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To get the ones you need just list number of each booklet described on this and the following pages. When you have filled out card, simply detach and mail. We'll do the rest. Postage is prepaid.

MACHINES AND ATTACHMENTS

1 METAL WORKING MACHINES—*Motch & Merryweather Machinery Co, 1550 E 222nd St, Cleveland 17, Ohio.* 50-page spiral-bound catalog illustrates and describes models of machines for circular sawing; saw sharpeners; milling and centering machines; bed-type milling machine; Mill-M-Matic machine; vertical turning and boring units, vertical drilling and boring machines; multi-purpose machines; in-line automatic transfer units.

2 HOBBING MACHINES—*Cleveland Hobbing & Machine Co, 1311 Chardon Rd, Cleveland 17, Ohio.* 12-page catalog 600 provides data and specifications for line of single spindle and rotary Rigid-hobbers. Features and typical installations illustrated. Automated, semi-automated, and manual models covered.

3 PRESSES — *Federal Machine & Welder Co, Warren, Ohio.* 8-page bulletin covers single-action, straight-side, single-crank presses in capacities from 60 to 400 tons. Another 8-page bulletin gives data on single-point, eccentric gear models, 100 to 1800 tons.

4 ELECTRONIC LINE TRACER FOR SHAPE CUTTING MACHINES—*National Cylinder Gas Division, Chemetron Corp, 840 N Michigan Ave, Chicago, Ill.* 7-page booklet describes features of device for attachment to NCG shape cutting machines. Tracing head follows automatically a drawing of part being cut, is extremely accurate, eliminates need for templets. Operation details covered.

5 50-TON COMPACTING PRESS—*Hamilton Div, Baldwin-Lima-Hamilton Corp, Hamilton, Ohio.* 4-page bulletin 3197 provides general information, specifications, illustrations, features and performance data on Model 50W for powdered metals, plastics, ceramics, carbides, cermets, and ferrites.

6 HIGH-SPEED PRECISION INDEX TABLES—*Ferguson Machine Corp of Indiana, 7818 Maplewood Industrial Court, St Louis, 17, Mo.* 16-page illustrated catalog 302 describes design characteristics of the roller gear drive indexing mechanism in company's line of Intermittor index tables and rotary transfer machines. Load ratings and dimensions of more than 175 index tables shown with dial sizes from 10 to 120 in.; 3 to 24 stops; and indexing periods of 90 to 270° of total cycle time.

7 SPINDLES—*Pope Machinery Corp, 281 River St, Haverhill, Mass.* 6-page bulletin S-11 covers heavy-duty precision spindles for grinders and other applications. Specific units illustrated and described.

8 LIGHT HEAVYWEIGHT MACHINE TOOLS — *Walker-Turner Div, Rockwell Mfg Co, 400 N Lexington Ave, Pittsburgh 8, Penna.* Brochure contains brief description and outline of specifications for complete line including 15 and 20-in. drillpresses; radial drillpresses, band and scroll saws; tilting arbor saws; 12-in. wood and metal lathes; bench, tool, and surface grinders; cutoff machines; jointers; spindle shaper; belt and disk sander.

TOOLS AND ACCESSORIES

9 SURFACE GRINDING WHEELS—*Cincinnati Milling Machine Co, Milling Products Div, Cincinnati 9, Ohio.* 8-page booklet PG-349 describes and illustrates straight sided wheels, segments, cylinders, cups, and nut inserted wheels for surface grinding operations. Table of suggested gradings for surface grinding included.

10 SCREW MACHINE CAMS—*American Cam Co, P O Box 2100, Hartford, Conn.* 20-page illustrated catalog covers complete lines of cams, cam blanks, standard and special form tools and other tools, tool holders and accessories for automatic screw machines.

11 TWIST DRILLS AND TOOLS—*Precision Twist Drill & Machine Co, 10 Woodstock St, Crystal Lake, Ill.* 40-page catalog C-58 gives details and prices on complete line including solid carbide and carbide tipped tools.

Fill in number of each bulletin wanted

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FOR YOUR INFORMATION

12 CLAMPS—*Wetzler Clamp Co, 45-15 11th St, Long Island City 1, NY.* 8-page catalog 58 contains illustrated descriptions of complete line for variety of applications.

13 MINIATURE THERMOCOUPLES—*Thermo Electric Co, Saddle Brook, NJ.* 28-page catalog gives data on line. Four basic designs illustrated and described: gasket, bayonet, protected, and shielded. Applications discussed; calibrations and temperature ranges, adapters and mounting accessories covered.

14 AUTOMATIC GRINDER CONTROLS—*Radio Corp of America, Building 15-1, Camden, NJ.* 4-page illustrated folder, Form 3R3342, gives data on controls for ID, OD, and surface grinding, adaptable to any type of grinder. Operating information provided on systems ranging from simple machine shut-off or alarm, to size indication and segregation, to automatically self-compensating gaging and control.

15 TUNGSTEN CARBIDE TOOLS—*S & E Machine Products, Inc, Bridgeport, Conn.* 48-page illustrated catalog T-58 gives dimensional data and application information on drill bushings, drills, end mills, reamers, burs, gages, master disks, centerless, grinding fixture, and special carbide cutting tools.

16 CARBIDE SLOT DIES — *Oberg Manufacturing Co, Silverville Rd, Tarentum, Penna.* 8-page bulletin 258 illustrates and describes dies that can be ordered from stock as standard items; pricing sheet included.

17 PORTABLE POWER TOOLS—*Thor Power Tool Co, Prudential Plaza, Chicago 1, Ill.* 47-page pocket-size catalog 85 pictures and gives specifications for all Thor electric and air tools.

18 GRANITE SURFACE PLATE RESURFACING—*Rahn Granite Surface Plate Co, 841 N Western Ave, Dayton 7, Ohio.* 4-page illustrated brochure gives information on method of calibrating worn plates; care of plates; formula for determining resurfacing cost; describes company's reconditioning service.

19 DIAL INDICATORS—*Petz-Emery Inc, Pleasant Valley, NY.* 12-page catalog D contains information on expanded line of Em-re instruments covering all four AGD groups. New design features illustrated and described.

PLANT SERVICE EQUIPMENT

20 ULTRASONIC CLEANING—*Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn.* 24-page bulletin S-200 explains applications and basic principles as well as design of equipment. Requirements and specifications of ultrasonic generators and transducers listed; illustrated data on various types of equipment included.

21 MATERIALS HANDLING EQUIPMENT—*Republic Steel Corp, Berger Div, 1038 Belden Ave, NE, Canton 5, Ohio.* 21-page illustrated booklet describes complete line of steel products including skids, box and skid units, special purpose units, tote pans, pallets, and many others.

22 AIR-OPERATED PUMPS—*Lincoln Engineering Co, 5703-27 Natural Bridge Ave, St Louis 20, Mo.* 32-page catalog 65 pictures and gives information on series of Power-Master pumps and allied equipment available in 19 pressure ratios to handle all materials from light oils to heavy fibrous greases and viscous coatings, sealers, and mastics.

23 OVERHEAD CONVEYOR—*American MonoRail Co, Conveyor Div, Fourth & Franklin Sts, Tipp City, Ohio.* 44-page catalog CDA describes the Cable-Way unit. Illustrates installations, and all of the components of the system.

24 AUTOMATIC POLISHING AND BUFFING MACHINE — *Murray-Way Corp, PO Box 180, Birmingham, Mich.* 4-page illustrated bulletin gives details, including specifications, on the Junior Automatic. Construction features pictured.

PARTS AND MATERIALS

25 HYDRAULIC CYLINDERS—*Miller Fluid Power Division, Flick-Reedy Corp, 2040 N Hawthorne Ave, Melrose Park, Ill.* 32-page bulletin JH-104N contains complete illustrated descriptive information on new Model J for 500-2500 psi service and Model H for 3000-5000 psi. Charts and tabular data cover column strength, piston rod deflections, acceleration, factors of safety, cylinder forces, selection factors.

26 MAGNESIUM TOOLING PLATE—*Dow Chemical Co, Midland, Mich.* 55-page illustrated shop manual covers properties, use of magnesium extrusions in tooling, shop characteristics of magnesium alloys, machining instructions, grinding and polishing, joining, surface protection, and good shop practices. Appendix lists standard sizes of round and square tubing, equal angles, and I-beams.

27 ZINC—*American Zinc Institute, Inc, 60 East 42nd St, New York 17, NY.* 96-page revised basic text presents wide variety of data on history, sources, production, significant properties, important applications. Illustrated with photographs, charts, graphs, and drawings.

28 ELECTRO-CLUTCHES — *I-T-E Circuit Breaker Co, Transformer & Rectifier Div, 19th & Hamilton Sts, Philadelphia 30, Penna.* 20-page catalog 6304-1A gives details on electrically operated devices for engaging and disengaging machinery gears and drives. Examples of applications; data and specifications on complete clutch line available in six basic designs with torque capacities from 1.8 through 13,000 lb-ft.

29 POLYVINYL PLASTISOLS—*Chemical Products Corp, King Philip Rd, East Providence 14, RI.* 16-page brochure discusses new end-uses for Chem-o-sol coating and molding compounds, describes varied application methods. Includes technical data on stock formulations and descriptions of anticipated future uses.

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"LIGHT-HEAVYWEIGHT"

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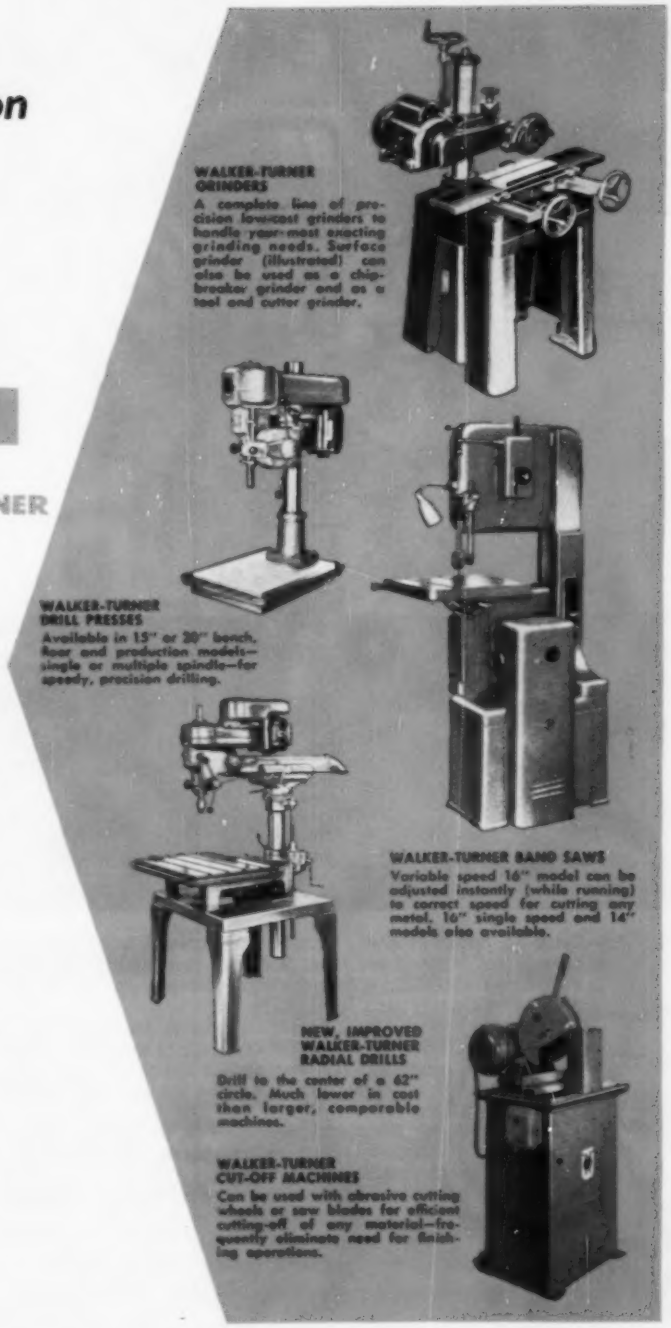
With Walker-Turner "Light-Heavyweight" Machine Tools, you get the precision features of larger, far more costly equipment. In addition, you get the advantages of versatility and portability that make your operations more flexible and more economical. That's why portable W-T tools are replacing fixed, heavier machinery, with substantial savings in initial investment and maintenance costs.

It will pay you to check today on the many ways W-T "Light-Heavyweights" can save time and money in your plant.



WALKER-TURNER GRINDERS
A complete line of precision low-cost grinders to handle your most exacting grinding needs. Surface grinder (illustrated) can also be used as a chip-breaker grinder and as a tool and cutter grinder.

WALKER-TURNER DRILL PRESSES
Available in 15" or 20" bench, floor and production models—single or multiple spindle—for speedy, precision drilling.

WALKER-TURNER BAND SAWS
Variable speed 16" model can be adjusted instantly (while running) to correct speed for cutting any metal. 16" single speed and 14" models also available.

NEW, IMPROVED WALKER-TURNER RADIAL DRILLS
Drill to the center of a 62" circle. Much lower in cost than larger, comparable machines.

WALKER-TURNER CUT-OFF MACHINES
Can be used with abrasive cutting wheels or saw blades for efficient cutting-off of any material—frequently eliminate need for finishing operations.

For a demonstration, call your W-T distributor (He's listed under "Tools" in your yellow pages)... or

MAIL COUPON FOR COMPLETE DETAILS!

walker-turner

WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WF-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

ROCKWELL

☐ Please send name of my Walker-Turner distributor.
☐ Please send new, complete catalog on Walker-Turner "Light-Heavyweight" Machine Tools.

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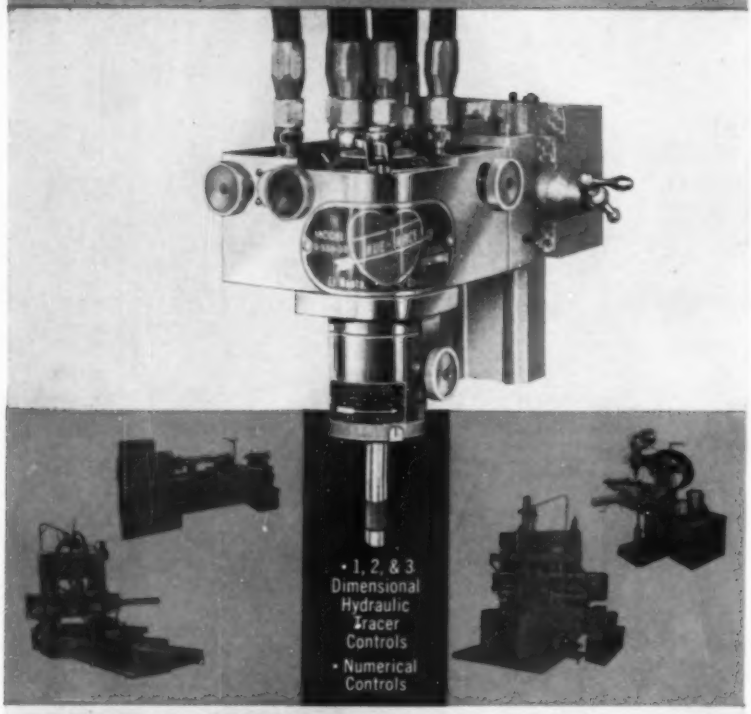
"AUTOMATE" YOUR MANUAL MACHINES

...WITH TRUE-TRACE CONTROLS!



Outmoded, manually-operated machines cost money, reduce production capacity and waste skilled labor. Modernize your existing machines with **True-Trace** machine tool controls—increase your ability to produce high quality parts economically.

Our factory representatives from coast to coast, and three factory sales,. engineering and service centers are ready to show you how to increase production on your contoured parts or straight line machining ... yet achieve close tolerances! Let us assist you with your contour machining problems.

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"Sponsors of the Contour Machining Conferences"

TRUE-TRACE SALES CORPORATION

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Branch Plants: 35 Urban Ave., Westbury, Long Island, New York

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Dealers in Principal Cities

bearings, this retainer-equipped unit reportedly will provide adequate capacity where excess misalignment prohibits using the greater inherent capacity of full complement bearings. It is available with or without separable inner races.

McGill Manufacturing Co, Bearing Division, Valparaiso, Ind.

Emulsion Cleaner 62 for cold cleaning of all metals removes heavy oil films and solid dirt, is furnished ready-to-use or as a concentrate. Requires only a plain steel tank or drum, without any heating or cooling facilities.

Enthone, Inc. 442 Elm St, New Haven, Conn

C-clamps, Rapid Titan line, incorporate among improved design features a body and nut cavity cast out of a single, one-piece mold with nut housing opening from the side instead of from the top; this is said to eliminate any possibility of shift in location of the cavity with respect to external shape of the clamp. Double-lead shallow cut Acme screw reportedly provides 40% greater strength.

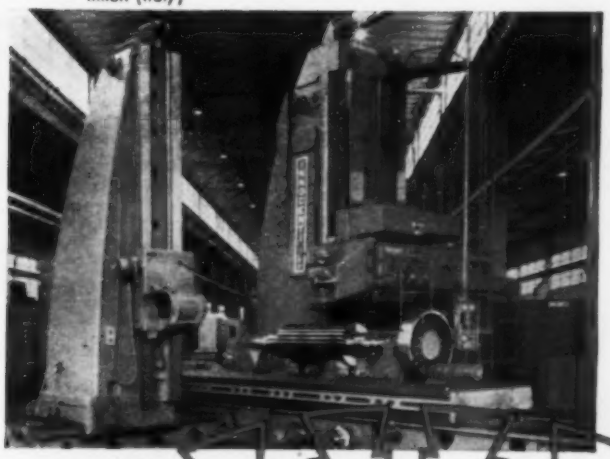
Wilton Tool Mfg Co, 9525 Irving Park Rd, Schiller Park, Ill

Ball bearing clutches added to Formsprag lines include three new sizes of high-speed units for overrunning applications (max bore dia of 4, 5 and 6 in.); six sizes of sealed models (same bore dia) for indexing and back-stopping; new Model **FS-1050** large-bore backstop clutch with max overrunning speed of 500 rpm, 9000-ft-lb torque capacity, max bore

(Continued on page 166)

"Harris, if this is about a raise again . . ."

works
in
milan (italy)



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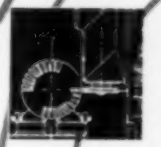
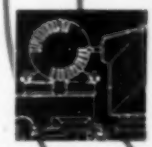
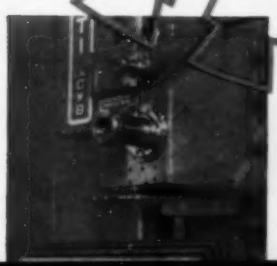
machining
a turbo alternator
rotor slot
by an INNOCENTI CWB
boring and milling machine
equipped with
heavy duty
high production
special headstock
model TE 25
profiling
is performed
without head removing.
large diameter
disk-type milling cutter
on the vertical spindle.



- CWB - BORING AND MILLING MACHINE

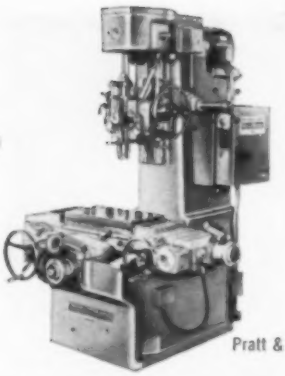


horizontal head
equipped with
finger-type milling cutter
for high speed
dovetail slots forming.
the head allows
a normal setting
of the machine
milling and boring
spindle
thus permitting also
flattening
and
milling operations
as for polygonal rotors.

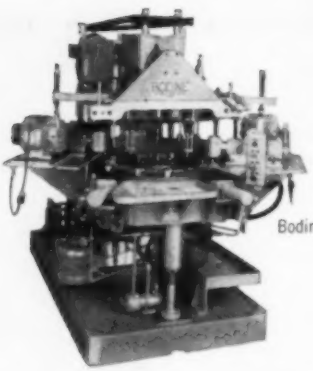


bertoni 5138

Hartford Special



Pratt & Whitney



Bodine

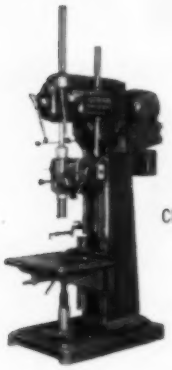
17 LEADERS

Stake their reputations on

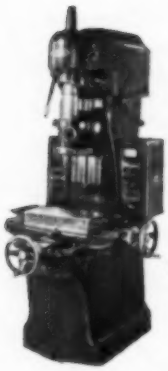
JACOBS CHUCKS

U. S. Drill Head

Greenlee

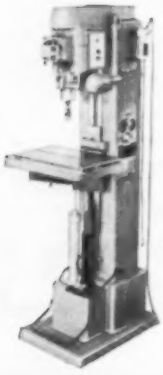


Cleereman

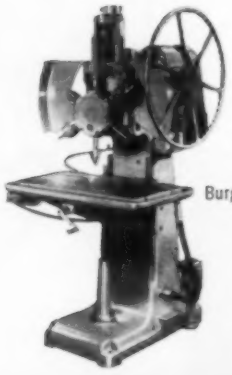


Moore

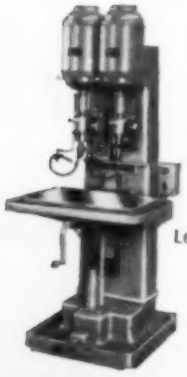
Dumore



Snow

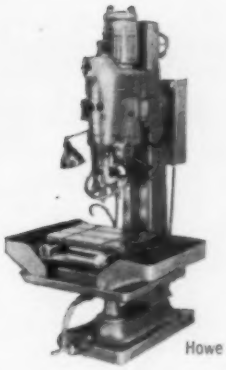


Burg



Leland-Gifford

American

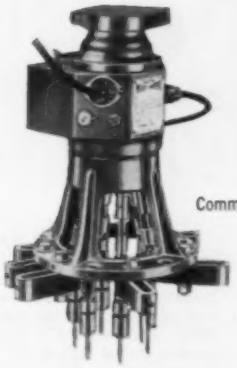


Howe & Fant

Fosdick

Chicago Quadrill

Jarvis



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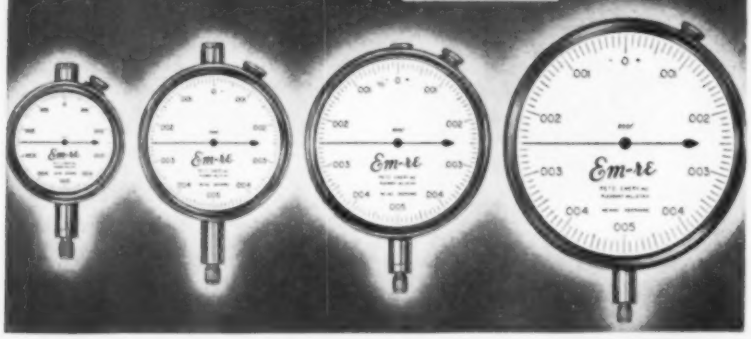
Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

The Jacobs Manufacturing Company
West Hartford, Connecticut

Jacobs
CHUCKS

NOW Em-re Dial Indicator Accuracy Available In A Complete Line



The unmatched performance of "Em-re" Dial Indicators is now available in a **complete** line, including all four A.G.D. groups. This new "Em-re" line of 96 different models provides bezel diameters of 1⅝", 2¼", 2¾" and 3⅝"; 9 ranges from .002" to .250"; graduations in .001", .0005", .00025", .0001" and .00005".

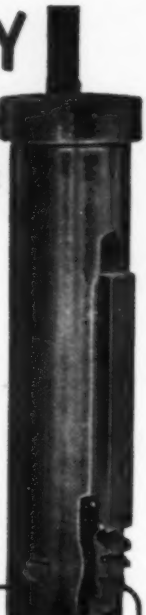
In each of these 96 models you'll find the same new standards of accuracy, repeatability and production life that have made other indicators **obsolete**. For example, "Em-re" .0001" models are accurate to within .00002". That's 1/5 of a graduation. And it will repeat through millions of applications. Each "Em-re" indicator is fully jeweled and completely shockproof over the entire range. Of 31 total parts, 26 are common to all "Em-re" models. Send today for literature on "Em-re" indicators.

Patented

PETZ-EMERY INC.

PLEASANT VALLEY, NEW YORK

The INSIDE STORY about NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed steel which are hardened to Rockwell specifications and accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

national

MACHINE TOOL CO.

CINCINNATI 22, OHIO

WRITE TODAY

for Catalog No. 17 complete, handy size

dia 6 in. New line of sleeve-bearing large-bore backstop units has also been introduced.

Formsprag Co, 23601 Hoover Rd, Warren, Mich

Magnetic clutches and brakes are available from stock in two diameter series: 1-1/16-in. dia, size 11 frame; and 1¾-in. dia, size 18 frame. Torque range is from 8 oz-in. to 40-oz-in.; speeds up to 5000 rpm. Catalog 15 lists five different size units.

PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY

HSS throwaway inserts stocked in Circle C and Van Chip grades are available for use in positive rake toolholders. They are particularly adaptable for difficult high temperature alloy turning applications. Data sheet available on both triangular and square inserts.

Firth Sterling Inc, 3113 Forbes St, Pittsburgh 30, Penna

Tool component line, available from stock, includes tool and fixture components, clamps, swivel washers, jig legs, jig buttons. All parts are made of stainless steel. Catalog 16 lists selection of over 500 different items.

PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY

Hydraulic pumps, low volume, gear type, designed for high pressure needs with low power consumption are offered for special hydraulic lift applications as well as the electric lift truck field. Pumps are available with either a tang drive shaft or keyed drive shaft, can be operated

(Continued on page 169)

"Doc's orders. He told me to take it easy for a few days."

Trimming steel plates with hydraulic shears cuts cost at Caterpillar Tractor Co.

8 ft. shear representing investment of less than $1 per hour pays for itself out of savings in 36 months. The 8 ft. Pacific shear at Caterpillar Tractor Co. shown here, the largest hydraulic in the world, cuts material up to 1½" thick from flat bar stock and plates to finished lengths and widths and trims angles. All heavy shearing at Caterpillar Decatur, Ill. plant is done on Pacific Hydraulic Shears.

Any plant, large or small, can reduce cost of shearing metals of sizes from 20 gauge to 2" plate with a Pacific shear of the corresponding size or with an adjustable rake Pacific shear.

Write for brochure

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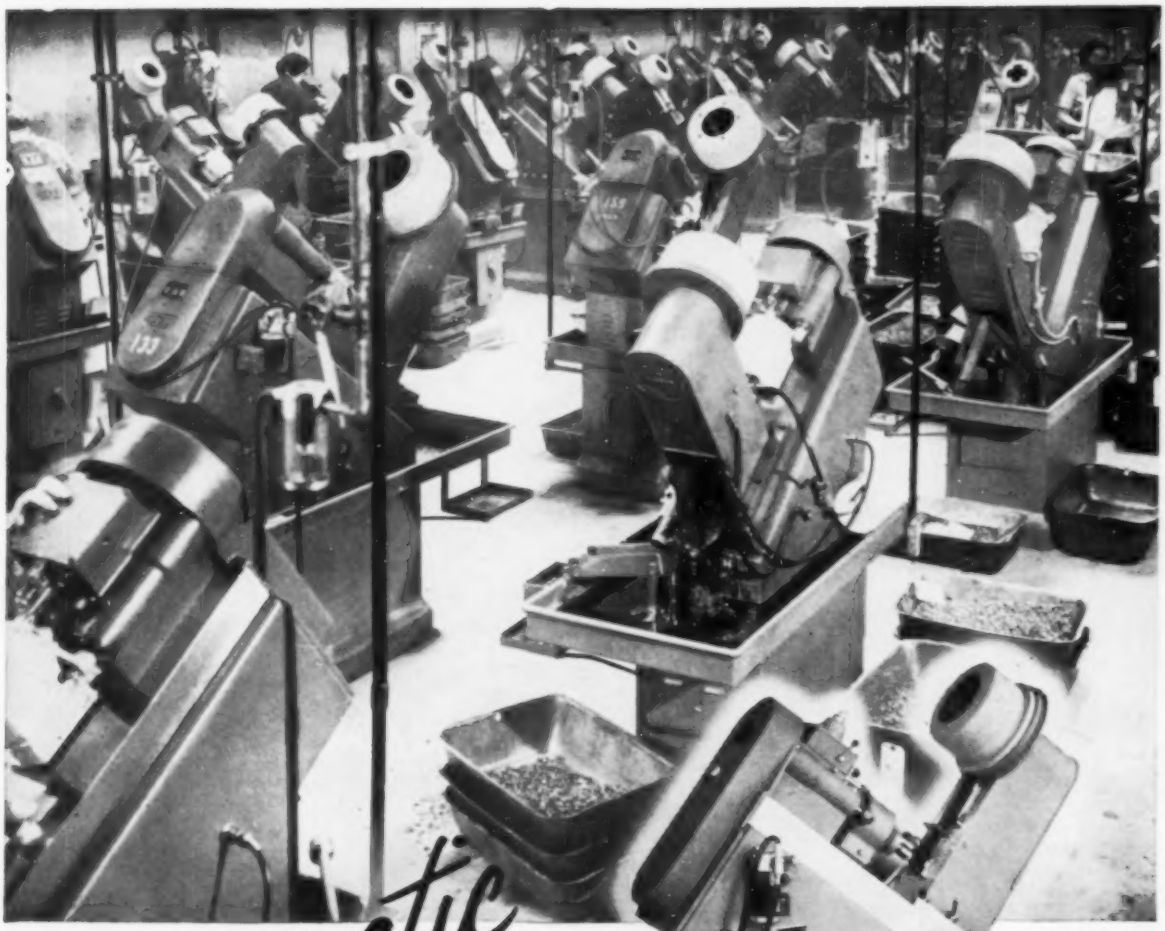


Automatic NUT TAPPING MACHINES

This installation *at Shakeproof, Division of Illinois Tool Works, Elgin, Illinois,* is an illustration of productivity—*with precision.*

Simplicity of set-up and lower operational costs can make your Nut Tapping Department one of the most efficient and profitable in your plant. Submit samples and prints for a comparison with your present method.

VERTICAL DRILLING MACHINES
VERTICAL TAPPING MACHINES
VERTICAL THREADING MACHINES
TWO SPINDLE MACHINES
ANGULAR MACHINES
NUT TAPPING MACHINES
HORIZONTAL MACHINES
DRILLING AND TAPPING UNITS
AUTOMATIC JIGS AND FIXTURES
DRILL PRESS TAP HEADS

SNOW

MANUFACTURING COMPANY

435 EASTERN AVENUE, BELLWOOD, ILL.

(Suburb of Chicago)

at speeds up to 2600 rpm. Pressures obtainable, according to capacity are (at 1750 rpm): 1.35, 2.4, 3.0, and 3.7 gpm—up to 1500 psi; 0.5, 0.75, 0.9, and 1.2 gpm—up to 2000 psi.

Webster Electric Co, Hydraulics Div, Racine, Wis

Impact wrench calibrator has been designed for wrenches used with bolts up to 2½ in. in dia. Literature available.

Skidmore-Wilhelm Manufacturing Co, 442 S Green Rd, Cleveland 21, Ohio

Brazing new cutter tips to shank of worn blades on Shear-Speed gear-shaping machines is a restoration service offered by Michigan Tool. After brazing, tools are precision ground to supply proper form and relief to cutting edge. Each blade is rigidly inspected to print tolerances and tool body reworked where required to control any possibility of excessive tooth error, or any accumulation of spacing errors.

Michigan Tool Co, 7171 E McNichols Rd, Detroit, Mich

Welding wire, Inco-Weld A, produces strong, ductile joints in a large number of dissimilar metal combinations. Features include excellent operability in all positions, high-strength and corrosion-resistant deposit, machinability, high impact resistance, good elevated-temperature properties, and X-ray quality welds. Wire is good for overlay applications. It is avail-

"There isn't much anyone can tell Fred about oiling the machines."

Industry's No. 1 choice... the V-Belt with concave sides

Here's the reason:
the concave sides of Gates V-Belts *insure far longer belt life.*

Make this simple test. Bend a Gates V-Belt with concave sides (Fig. 1) as if it were going around a sheave. Feel how the sides *fill out*... become perfectly straight (Fig. 1-A). Note how this belt makes full contact with the sides of a sheave... grips the sheave evenly, distributing wear uniformly across the sides of the belt. Uniform wear lengthens belt life—keeps costs down.

Now make the same test with a straight-sided belt (Fig. 2). Feel how the sides bulge out, (Fig. 2-A) concentrating wear at the points shown by arrows. Uneven wear shortens belt life; increases belt costs.

Because Gates V-Belts with concave sides are so universally preferred, they are also the *most widely available*. There are Gates distributor stocks in industrial centers throughout the world.

The Gates Rubber Company
Denver, Colorado
World's Largest Maker of V-Belts

TPA 312

Gates **Gates Vulco Rope Drives**

or to *any* intermediate speed, *instantly*

Just raise or lower the T-handle control, and watch the large tachometer dial in the headstock! It's that easy! The work is done by a power driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds —200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

SHELDON *Variable Speed* **PRECISION LATHES**

(1) T-Handle Speed Selector
(2) Micro-Switch Direction Control
(3) Speed Change Mechanism
(4) 2 H.P., Three Phase Motor
(5) Belt-tension Adjustment
(6) Multiple V-Belts

SHELDON MACHINE CO., INC.

1234 N. Knox Ave. • Chicago 41, ILL.

10", 11" and 13" SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)

13" and 15" SEBASTIAN Geared Head Lathes

SHELDON Milling Machines

SHELDON Back Geared Shapers

Write for variable Speed Circular and General Catalog

able as 36-in. lengths in diameters of 1/16, 3/32, ⅛ and 5/32 in., and on spools in diameters of 0.035, 0.045 and 0.062 in.

International Nickel Co, 67 Wall St, New York 5, NY

Vibratory lapping machines, available in five standard models, have following improvements: steeper leaf spring angle in drive unit creates greater horizontal pan movement, permitting more effective lapping of thinner parts (to 0.0010 in.); new pan sizes in range of from 5 to 30 in. dia; special clamping ring for holding abrasive cloth in unit's pan.

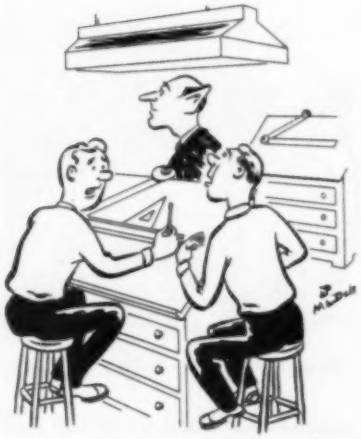
Syntron Co, 311 Lexington Ave, Homer City, Penna

Rotating bin dumping attachment, 8000-lb capacity, for Yale lift trucks, can handle bins from 30 to 34 in. in width, 23 to 32 in. in height, and up to 48 in. long. Attachment rotates a full 360° in either direction.

Yale & Towne Manufacturing Co, Materials Handling Div, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

Circularity grinding attachment for grinding or reworking of cutting tools provides simple, fast setups for quick, easy grinding of form relief; radial relief; both together; tapered cylindrical and straight cylindrical. Where full length of spiral cutting tools is to be ground for both form and radial relief, attachment travel is similar to an OD grinder, which insures fine finish, back taper, and accurate size.

Detroit Reamer & Tool Co, 780 W Maple Rd, PO Box 174, Birmingham, Mich



"He designs automobile rear fenders."

FIELD REPORT...

Submarines To Get Bosch-Arma Fire Control Systems

Award of a $3,250,000 contract to American Bosch Arma Corp by the Navy has been announced. Company will produce additional fire-control systems for submarines at its Arma Div, Roosevelt Field, Long Island, NY. Known as the Mark 101 fire-control system, it's already in use aboard Navy submarines for the firing of torpedos. System was designed and developed at Arma for the Bureau of Ordnance of the Navy.

Chemical Milling Techniques . . .

. . . of US Chemical Milling Corp, Manhattan Beach, Calif, are broadened by the recent purchase by that company of Foto-Etch Circuits, Los Angeles. Company also recently acquired Missile-Air and Hydro Metal Spinning Corp of Los Angeles, both engaged in the fabrication of airborne and spaceborne components.

Johnston & Funk Titanium Joins Mallory-Sharon

Johnston & Funk Titanium Corp, Wooster, Ohio, has been acquired by Mallory-Sharon Metals Corp, Niles, Ohio. Products are titanium rod for bolts and nuts and vacuum-melted steel welding wire.

Largest Aluminum Plate Stretcher To Be Built at Kaiser Aluminum

World's largest aluminum-alloy stretching machine built by Hydraulik GmbH of Duisburg, Germany, will be put up at the Kaiser Alumi-

"The gist of it seems to be there's a draft at his machine that hits him in the back of his neck."

For the Best RETURN on your invested dollars in **COLD FINISHED STEEL**

SPECIFY

WYCKOFF

Over the years Wyckoff has balanced its overall production facilities to meet the most exacting requirements of all specifications involving: Optimum Machining Properties . . . Accuracy . . . Outstanding Finish . . . Controlled Physical Properties through diversified Furnace Treatments.

Our technical staffs are always at your service.

OUR CONSTANT RESEARCH PROGRAM IS YOUR BEST GUARANTEE OF QUALITY CONTROL

WYCKOFF STEEL PRODUCTS: Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2½" and 14" x 1½" All types of Furnace Treated Steels.

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we took the puzzle out of jig boring

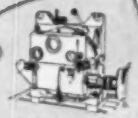
with the

DIXI 60

horizontal optical jig borer

(Made in Switzerland
Measurements in Inches

The only horizontal jig borer that combines the accuracy of the vertical spindle with the versatility of the horizontal spindle.



DIXI 450 Optical Precision Rotary Table

ACCURACY: Optical settings provide an overall accuracy of .0002".

VERSATILITY: The combination of the Dixi 60 and the Dixi 450 precision optical rotary table (illus.) permits jig-less boring, facing, milling and drilling work in all planes and compound angles between them with optical interrelationship all in one set-up.

PRODUCTIVITY: A complete optical setting including unclamping, positioning, fine adjustment, reclamping and rechecking takes less than 10 seconds. Convenient and functional controls eliminate idle machine time.

The DIXI Optional Reversing Process assures perfect alignment in work pieces with line bores, as well as round, taper-free holes. Get all details on this process by writing for illustrated catalog.

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.— Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the Dixi 60.

MBI

M.B.I. EXPORT & IMPORT LTD.
A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery"

Field Report . . .

num plant at Ravenswood, W Va, next year. Tentative figures indicate that performance will be roughly double that of any machine now in existence.

When erected, the stretcher will be capable of pulling slabs of aluminum out to thicknesses of 6 in. Max plate width and length are planned at 13¼ and 58½ ft respectively. Installation is to be made in a 1170 x 212-ft pit, 14½ ft deep. No supporting or guiding framework will be used for the stretcher assembly; the machine will move backward and forward on its own rails. The two sections of the 38-in. forged steel columns arranged at each side will be held apart by single hydraulic cylinders developing a pressure in the region of 6000 psig. Two-piece drawing or stretching heads will be held together by 14½-ft anchor blots.

Garrett Ups Wages 6%

Four AiResearch Mfg divisions of Garrett Corp, Los Angeles, fall under a 6% overall wage increase for hourly and salaried employes except officers and directors. Announcement by J C Garrett, president, indicated total payroll will increase $3.4 million yearly; hourly increases range from 9-20¢.

Ipsen Industries Expands

Ipsen's Ceramic Division, set up on a small basis several years ago, has outgrown initial demands. Manufacturing facilities have been moved to a new 15,000 sq-ft plant in Pecatonica, Ill, where it will continue to make high temperature, high density porcelain specialities such as furnace heating tubes, ceramics for chemical use, and ceramic parts for

"Why don't you just go to him in a perfectly straightforward manner and lie your way out of it."

"The Board balked at first...

but I convinced them that now was a good time to buy!"

When machine tool builders work with smaller backlogs they're naturally more efficient and can make better deliveries... are more able to control costs ...more able to render the many *extra* custom engineering services that disrupt regular production during peak schedules. As a matter of fact, many progressive buyers are at their busiest now... taking advantage of the sound buying position the economy gives them as it pauses for its breath... seizing the opportunity to get ready for tomorrow today.

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SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

BLISS is more than a name... it's a guarantee

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

the shortest route to MORE PROFIT
. . . produce MORE in 1958!

If you can reduce costs while producing more, the job is twice as easy. This is where PEECO can help.

In every case illustrated above, as well as in hundreds of other examples, PEECO successfully helps production men reduce their costs by producing more—automatically.

If your equipment, machinery, production or assembly line is *not* now using parts feeders the chances are your costs are too high. Let a PEECO Sales Engineer give you the facts. He'll gladly help you without obligation. Write for literature and name of representative near you.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF VIBRATORY PARTS FEEDERS

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Field Report . . .

a variety of unusually high temperature and abrasive requirements. High temperature, high vacuum experimental equipment is available for research development in the fields of metallurgy, ceramics, and cermets.

Ampco To Distribute in Southwest

. . . from newly opened Garland, Texas, casting plant. Ampco metal and aluminum-bronze alloys will be available in castings up to 1000 lb. Production is planned for aircraft, chemical, petroleum, and metalworking industries.

Topp Manufacturing Co Contract

Topp, Los Angeles division of Topp Industries, Inc, has a $1.1 million order for angle of attack detectors, indicators, computers, and other related units. Systems are intended for use on an unspecified Navy fighter.

Low-Temperature Nickel Alloy Available at Lower Cost

Lukens Steel Co, Coatsville, Penna, has announced production of a low-carbon, high-nickel alloy called Nickel Nine, which is suitable for temperatures down to –320F and which costs about half of conventional low-temperature alloys.

Diamond Reclaim Service . . .

. . . is now being offered by the Abrasives Div of the Elgin National Watch Co. Service will either assay sludge and buy it outright, or will

"I must be bogged down in this job now—the other day I caught myself thinking that maybe the boss wasn't too bad a guy after all."

clean, regrade, and return the diamond content. Company also offers a compounding service for reclaimed material after cleaning and grading. Service reportedly is completed in two to eight weeks, depending on the type of operation desired.

Anaconda Buys Cochran Foil

Aluminum sheet, foil, and laminated products will be marketed from both the Terre Haute, Ind, and Columbia Falls, Mont, plants of Cochran Foil Corp, now a subsidiary of Anaconda Co. President of the subsidiary is Archibald P Cochran, vice president is Mord Lewis, also executive VP of Anaconda Aluminum Co.

Systems for 20 Missiles . . .

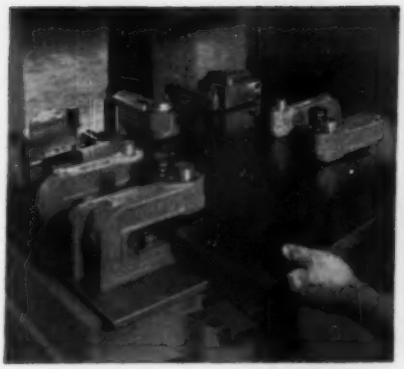
. . . will account for more than half of the 1958 sales at the Pacific Div of Bendix Aviation Corp. Work on the missile projects will make up 54.4% of the division's sales during this year; production of components for aricraft will account for 24.7% and submarine and surface-craft work 16.5%.

Belgian Concern Awards Large Beryllium Contract

A $1.2 million order, reportedly the largest commercial contract ever made for fabricated beryllium metal, has been awarded by the Centre d'Etude de l'Energie Nucleaire (CEN) of Belgium to the Brush Beryllium Co of Cleveland. Contract calls for Brush to fabricate two core matrices for Belgian Reactor-2, a high-flux materials and engineering

"There's something I must talk to you about, Snyder, but rather than spoil your dinner tonight we'll let it wait until tomorrow."

Strippit Punching and Notching Units are easily mounted to templates, T-slotted plates or rails in unlimited patterns for long press runs or quick-change pilot runs. Complete range of standard tools, or "specials" made up on request.



the **bench man** does the tooling!

STRIPPIT multiple punching and notching

THE ABOVE CUTAWAY of a Strippit Punching Unit — one of a wide selection for flats, structurals and extrusions up to ¾" mild steel — illustrates the extreme flexibility, high production and economy of the Strippit system.

NOTE THAT each unit is complete with punch, die button, stripping guide, guide button, lifter assembly and retainers — all quickly interchangeable in a husky holder and actuated by the press ram. Multiple punching — and notching — press setups are easily bench-assembled on drilled mounting templates, with each unit accurately located by the pilot pin in its base. Press down-time is almost negligible in setups of Strippit Punching Units, Notching Units, Punch and Die Assemblies or combinations of all three.

Write today for full details and if you wish, a demonstration on your work at your plant by a Strippit mobile unit.

Warehouse stocks in Chicago and Los Angeles.

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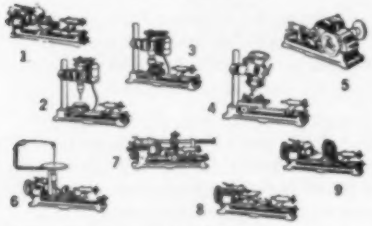
MACHINE TOOL
JUST
SIXTEEN
INCHES
AND YOU'VE GOT IT MADE!

precision
workshop-in-miniature
saves time and money

UNIMAT

MANUFACTURERS developing new products find Unimat indispensable in the mock-up shop. No need to waste big, expensive-to-run machinery on tooling small parts. ENGINEERS and DESIGNERS supplement their sketches and blueprints with machined-to-scale models anybody can "read." TECHNICIANS in research labs turn out machine work with amazingly small tolerances, down to .0004-of-an-inch! Hundreds* of efficiency-minded companies, hospitals and government agencies are now putting their UNIMATS to a thousand-and-one-uses; let us tell you how they can serve *you*.



Attachments and accessories that turn Unimat into a **complete** machine shop: 1. Lathe 2. Drill Press 3. Tool and Surface Grinding Machine 4. Milling Machine 5. Polishing and Grinding Machine 6. Jig Saw 7. Threader 8. Circular Saw 9. Indexer and Divider.

*To mention a few:
Atom Products Division of GE,
U.S. Naval Research,
Bell Telephone Laboratories,
Westinghouse,
Pratt & Whitney,
Raytheon,
NYU-Bellevue Medical Center,
Sandia Corp.,
Smithsonian Institute,
General Motors

Write for illustrated literature and price list

AMERICAN-EDELSTAAL UNIMAT DIV.

Dept. No. AM1 • 350 Broadway • N. Y. 13, N. Y.

Field Report . . .

test reactor now under construction at Mol, Belgium for CEN. The unit is expected to become operational in late 1959.

Expansions in the South . . .

. . . include a plant enlargement (by 1/3) by Douglas & Lomason Co, Carrollton, Ga (for auto trim), . . . enlargements of warehouse and fabricating space by L B Foster Co, Atlanta, . . . activation of Chrysler Corp's Atlanta regional training center, to handle 6000 sales and service men annually. This is the first of a series of these facilities, . . . organization of Wire Rope & Fittings Co, Atlanta, to specialize in sales and service of wire rope and fittings, . . . move of Challanger Mfg Co from Memphis to Jackson, Tenn, . . . organization of Filtered Metals Co, Knoxville, Tenn, to make car and tractor gears, crankshafts, and bearing blocks, . . . new plant for Stainless Metal Products Co, Chattanooga, Tenn, . . . new plant for Strom Steel Ball Co, Erwin, Tenn, to cover 40,000 sq ft and open in August, . . . organization of Etowah Awning Co, Etowah, Tenn, to produce aluminum awnings, car ports, and patios.

Faster Anti-Submarine Bombers . . .

. . . should result from a $2 million research and development contract awarded to Lockheed Aircraft Corp's California Div by the Navy. The new sub-hunter, a military version of Lockheed's prop-jet Electra, will be the nation's first turbine-powered ASW plane. Top speed will exceed 450 mph. Fuselage will include a plastic tail "stinger" housing a "MAD" unit, which seeks out submerged metallic objects by noting any deviation in the normal magnetic fields.

Hol-Gar Generator Contract

$2.8-million contract for 426 electric generators has been awarded by the Army Procurement office to Hol-Gar Mfg Co, Clifton Hts, Penna. Award was given in conformity with policy of supporting small businesses in excess-labor areas.

Pullman-Standard Car Mfg Co. . . .

. . . has started the second phase of a multi-million-dollar expansion and improvement program at its Bessemer, Ala, freight car plant. This will add 35,000 sq ft of covered manufacturing area, enabling company to turn out 2000 tons of freight car parts per month while maintaining its capacity building schedule of new cars.

Wagner Brothers, Inc, Merger

Allied Research Products, Inc, Baltimore, and Wagner Brothers, Inc, of Detroit have merged. Allied acquired the metal finishing operational assets and products of Wagner. Out of the metal finishing field, Wagner will continue to operate its subsidiary, Automatic Molding Machine Co.

Crucible Reopening Midland Plant

Crucible Steel Corp is resuming iron and steel making operations at its Midland, Penna, works. Facility had been closed in April. Company had laid off 1300 employees when it ceased operation, recalled 600 when orders began to take an upturn, and has now called back another 400.

Lockheed's Georgia Division . . .

. . . at Marietta has a million-dollar-plus contract calling for remodeling of two C-130A's, designated by the Air Force as a universal drone launcher. The Division has also set up a new branch, Georgia Nuclear Laboratories, to design and build nuclear reactors for production of industrial heat.

Redstone Arsenal . . .

. . . has announced plans to add 1150 workers to its Army rocket and missile staff at Huntsville, Ala.

"I don't mean to bug ya dad but I can't jockey this beetle no more. Like it's a drag; I mean I'm beat . . . Don't ya dig me pops? Lay the message on me man! Say something, you look like your stoned daddy!"

Better Saws...

BEGIN WITH SHARON QUALITY SAW STEELS

Sharon metallurgists have for the past decade concentrated on the development of better saw steels. As a result, they have established an industry-wide reputation for steels with a balance of toughness and hardness to absorb maximum punishment without fracturing or dulling.

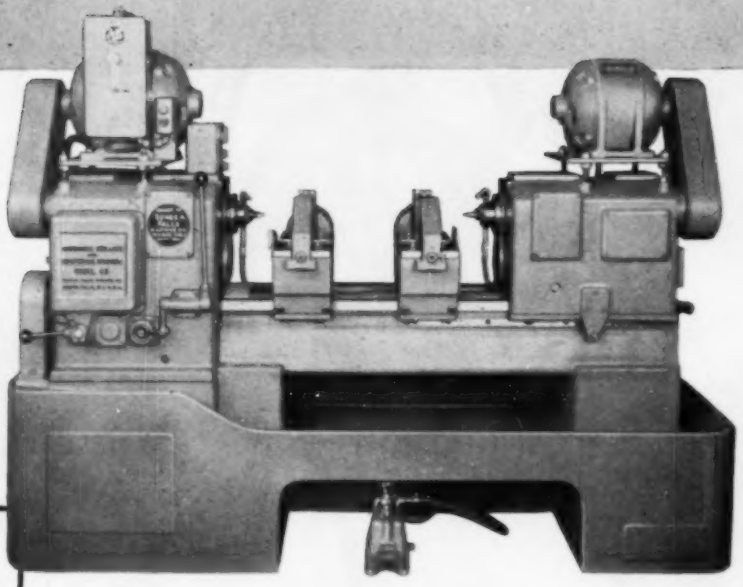
It will pay you to contact your Sharon salesman and get the facts on these durable, edge-holding steels for saws or any cutting tool or implement.

SHARONSTEEL

SHARON STEEL CORP.

SHARON, PENNSYLVANIA

How this manufacturer got his CENTERING MACHINE for nothing



BUILT-IN FEATURES OF MODEL "CS" AUTOMATIC CENTERING MACHINE

- Positive control of center depth to +.001".
- Accurate location of the work piece to assure correct center depth at both ends.
- Correct angle and perfect alignment of center holes.
- Double action feed cam to produce a smooth cleanly finished center hole.
- Quick change-over through pre-set graduated cams.
- Complete automatic cycle, 100% mechanical.
- Automatic work handling equipment available.

who?

A valued customer needed five Seneca Falls Model "LQ" Automatic Tracer Lathes to turn miscellaneous shafts in average sized lots. He had a tight budget for the machines, but when the cost of a quantity of endwise locating devices was added, there was a real strain!

how?

He substituted a Model "CS" Automatic Centering Machine (to maintain overall shoulder lengths), eliminating any need for the more costly locating devices.

He is now the happy owner of a super-accurate, versatile Centering Machine that every day is saving money around his shop.

can you

afford *not* to own a Model "CS" Centering Machine when you can pay for it quickly out of savings?

Write for your copy of Bulletin CS-47.

SENECA FALLS MACHINE

ENGINEERED FOR PROFIT

SENECA FALLS MACHINE CO.

SENECA FALLS, NEW YORK

Lo-swing Lathes and Seneca Falls Machine Tools, Automation and Electronics

Albert L Knapp (left), vice president and manager of the Machinery Division of Pratt & Whitney Co, West Hartford, Conn, and **Edward J Shages**, vice president and manager of the Cutting Tool and Gage Divisions, have been named to head the sales activities of their respective operations. Sales functions of these divisions had previously been under the managership of the late **Alexander S Keller**, vice president and general sales manager (*AM*—June 2 '58, p 147)

Dan W Burns, vice president and general manager of Hufford Corp, El Segundo, Calif, subsidiary of Siegler Corp, has been elected Hufford president to succeed **Merrill L Bengtson** who is chairman of the executive management committee of Siegler

NAMES IN THE NEWS...

J Hubert Cuni has been appointed vice president and director of industrial relations for Lodge & Shipley Co, Cincinnati, Ohio. **Joseph A Brinkman**, formerly secretary and assistant treasurer, has been named secretary and treasurer; and **William A Ott**, controller.

James Knowles has been named executive assistant to the vice president, manufacturing, of Ford Motor Co. He was formerly chief engineer of the Transmission and Chassis Division product engineering office.

T G Bishop, formerly manager of the Plastics Machinery Division of Hydraulic Press Mfg Co, Division of Koehring Co, Mount Gilead, Ohio, has been named product market manager. **W G Kriner**, manager of dealer sales, takes over Mr Bishop's former post.

Silas S Cathcart has been elected vice president of Illinois Tool Works. He will continue to serve as general manager of the company's Fastex Division at Des Plaines, Ill.

Stephen J Tompkins has been appointed chief engineer and director of Truck Products of the Dodge Division of Chrysler Corp; **George W Gibson** has been named chief engineer and director of Car Products. Mr Tompkins was previously chief engineer of truck operations, and Mr Gibson was assistant chief engineer of Dodge car operations and staff engineer, Automotive Group, Chrysler.

E F Borisch, executive vice president of Milwaukee Gear Co, has been elected president of the American Gear Manufacturers Association. **John L Buehler**, president of Indiana Gear Works, has been named vice president of AGMA's Gear Products Division, and **Folke Richardz**, consulting specialist, gearing products, Westinghouse Electric Corp, is new vice president, Technical Division.

Kenneth A Halcomb has been named manager of the Portland, Ore, plant of the Atkins Saw Division of Borg-Warner Corp. He was transferred from the firm's main office in Indianapolis to head expanded operations under which the Portland branch will serve 11 western states.

Herbert C Cress has been named vice president and works manager of Ford Instrument Co, Long Island City, NY, Division of Sperry Rand Corp. He was formerly vice president, operations, for Sperry Farragut Co, another of the corporation's divisions in Bristol, Tenn.

J Wesley Lee, executive vice president and general manager of Challenge Machinery Co, Grand Haven, Mich, has been elected president and general manager. He succeeds his father, the late **J Edgar Lee. Robert C Gould**, assistant secretary and assistant sales manager, has been named vice president.

Henry Wohlers has been appointed to the new post of staff engineer for the machine and tools division of Michigan Tool Co, Detroit. He has been serving as a special assistant to the director of research.

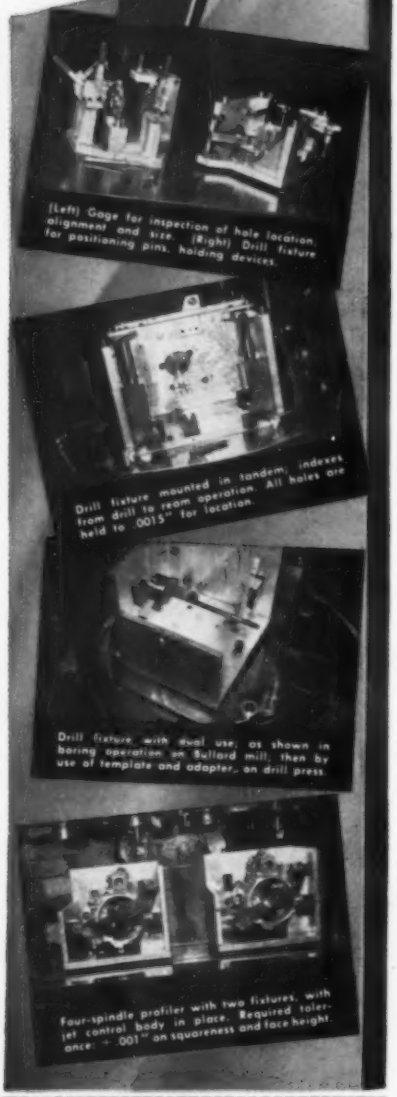
Carl E Rowe, vice president and general manager of Milwaukee Valve Co, Schiller Park, Ill, has been named president.

(Continued on page 181)

E L Oehling, general sales manager of Hydraulic Press Mfg Co, has been made vice president, sales. (Additional appointments above)

Michael Zajac, chief engineer of Buhr Machine Tool Co, Ann Arbor, Mich, has been appointed vice president, engineering

4 EXAMPLES of many thousands SHOWING Why PIONEER 921-T TOOLING PLATE is the choice of TOOL ENGINEERS



(Left) Gage for inspection of hole location, alignment and size. (Right) Drill fixture for positioning pins, holding devices.

Drill fixture mounted in tandem, indexes from drill to ream operation. All holes are held to .0015" for location.

Drill fixture with dual use; as shown in boring operation on Bullard mill; then by use of template and adapter, on drill press.

Four-spindle profiler with two fixtures, with jet control body in place. Required tolerance: ± .001" on squareness and face height.

Pioneer 921-T Cast Aluminum Tooling Plate can be adapted to any precision tooling job without preliminary milling. Every Pioneer 921-T plate, ¾" or more in thickness, is held within a flatness tolerance of .010" in all directions. It is extremely stable, weighs 60-70% less than tool steel and possesses high tensile strength. The special aluminum-titanium alloy composition of Pioneer 921-T and method of casting insures uniformity, and guarantees freedom from porosity, distortion and casting defects. Being easily sawed, tapped, milled or welded, Pioneer 921-T is a universal tooling metal, saving material, time and man hours to reduce overall tooling costs.

At the left are shown a series of precision fixtures in which Pioneer 921-T was used in order to meet close tolerance requirements in the manufacture of a jet fuel component. Mail the coupon and receive free, all issues of TOOL TALK, presenting new and unusual applications of Pioneer 921-T.

SPECIFY PIONEER 921-T AND ORDER FROM THESE METAL SUPPLIERS

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CLEVELAND, O.: Kaole Steel Corp.
DALLAS, TEX.: Vinson Steel & Aluminum Co.
DEARBORN, MICH.: Pioneer Aluminum Inc.
DENVER, COLO.: ABC Metals Corporation
DETROIT, MICH.: Kaole Steel Corp.
Meier Brass and Aluminum Co.
GRAND RAPIDS, MICH.: Kaole Steel Corp.
HARTFORD, CONN.: American Steel & Aluminum Corp.
HILLSIDE, N.J.: Edgcomb Steel & Aluminum Corp.
HOUSTON, TEX.: Vinson Steel and Aluminum Co.
JERSEY CITY, N.J.: Joseph T. Ryerson & Son, Inc.
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LOS ANGELES, CALIF.: Braico Metals Co., Inc.
Continental Metals Co., Inc.
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Tool Components, Inc.
LOUISVILLE, KY.: Reynolds Aluminum Supply Co.
MEMPHIS, TENN.: Reynolds Aluminum Supply Co.
MIAMI, FLA.: Reynolds Aluminum Supply Co.
MILWAUKEE, WIS.: Joseph T. Ryerson & Son, Inc.
NASHVILLE, TENN.: Reynolds Aluminum Supply Co.
OAKLAND, CALIF.: Earle M. Jorgenson Co.
RICHMOND, VA.: Reynolds Aluminum Supply Co.
ST. LOUIS, MO.: Industrial Metals, Inc.
SOUTH BEND, IND.: Kaole Steel Corp.
TULSA, OKLA.: Industrial Metals, Inc.
UNION, N.J.: Mapes & Sprawl Steel Co.
WALLINGFORD, CONN.: Joseph T. Ryerson & Son, Inc.
WICHITA, KAN.: Industrial Metals, Inc.

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NAMES IN THE NEWS...

Herbert E Markley, assistant to the president of Timken Roller Bearing Co, Canton, Ohio, has been elected vice president. His duties will include responsibility for all foreign operations of the company. **Richard L Frederick,** director of industrial relations, succeeds Mr Markley.

Wencel A Neumann, Jr, executive vice president, manufacturing, of De Laval Separator Co, Poughkeepsie, NY, has been elected president of the company and of its West Coast subsidiary, De Laval Pacific Co, Millbrae, Calif. **C B Schmidt,** whom Mr Neumann succeeds, has been named vice chairman of the board.

Robert E Busher has been named vice president, sales, of Friden, Inc, San Leandro, Calif. He succeeds **Lawrence B Taylor,** who has resigned. Mr Busher has been serving for the past year as consultant to Friden management on sales matters.

W A Meddick, vice president and sales manager of Elwell-Parker Electric Co, Cleveland, has been elected president and general manager to succeed the late **Sheldon K Towson. Sheldon K Towson, Jr,** formerly assistant to the president, has been named vice president and assistant general manager.

J L Chase has been promoted from district sales engineer to Detroit district sales manager for E W Bliss Co's Press Division. He succeeds **F P O'Keeffe** who has retired.

R H F Dade has been made vice president, Chemical Division, of Food Machinery & Chemical Co. He was formerly general manager of the fine chemicals department at Baltimore. **J Ford Wilson,** general superintendent of the Baltimore plant, has been promoted to resident manager.

Louis B Kazmerowski has been appointed production manager of Chrysler Corp's Delaware Assembly plant at Newark, Del. **Louis J Pace,** superintendent, final car assembly, succeeds Mr Kazmerowski as general production superintendent.

Robert O Bass has been elected president and general manager of Morse Chain Co, Ithaca, NY, subsidiary of Borg-Warner Corp. Formerly executive vice president and assistant general manager of Morse, he succeeds **Stanley J Roush** who is giving up his duties in Ithaca in order to devote

Atrax PROGRESS REPORT
SOLID CARBIDE TOOLS

CASE HISTORY #27
MAJOR INDUSTRIAL MANUFACTURER

Atrax
END MILL
Series 1604
¼" RH Spiral

OPERATION Milling ¼" slot to .045" depth
MATERIAL Cast Iron
SPEED-FEED 8,000 r.p.m.
PRODUCTION Atrax solid carbide end mills operated 20 hours continuously with no apparent wear.

CASE HISTORY #40
EASTERN AIRCRAFT MANUFACTURER

Atrax
E 141
BUR
Extra Coarse

OPERATION Burring piece parts
MATERIAL Aluminum
SPEED-FEED 20,000 r.p.m.
PRODUCTION One Atrax solid carbide bur produced same number of parts as 48 HSS burs.

CASE HISTORY #49
EASTERN ELECTRONICS MANUFACTURER

Atrax
#53 DRILL
Series 1815

OPERATION Drilling
MATERIAL Glass base melanine
SPEED-FEED Standard speeds, hand fed
PRODUCTION One Atrax solid carbide drill outlasted 1200 HSS drills.

Atrax

SEND TODAY for 96 page "STANDARD REFERENCE" on Carbide Tooling!

THE ATRAX COMPANY
Newington 11, Connecticut

Here's how CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

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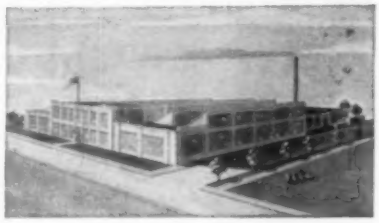

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Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NAMES IN THE NEWS...

more time to responsibilities as a group vice president in the B-W central office in Chicago.

Ross H Begg, Jr, has been promoted from executive engineer to assistant to the general manager of Pratt & Whitney Aircraft, East Hartford, Conn.

A J Kathmann has been promoted from assistant works manager to works manager of Gardner-Denver Co, Quincy, Ill. He succeeds **Robert Williams,** named general plant advisor.

Edward C Kinnaman has been promoted from quality control manager to production manager of Alloy Precision Castings Co, Cleveland.

Dwight W Kaufmann has been appointed manager of Crucible Steel Co of America's Titanium and Vacuum Metals Product Division. Formerly associated with Rem-Cru Titanium, Inc, he was named product manager of Crucible's Titanium Division, created when the company acquired full ownership of Rem-Cru.

E Theodore Neubauer, formerly associated with the Trane Co, La-Crosse, Wis, has been appointed vice president, engineering, of Copeland Refrigeration Corp, Sidney, Ohio.

Brian J Sturman, Jr, has been promoted from assistant manager to manager of Westinghouse Electric Corp's manufacturing and repair plant at Compton, Calif.

Clyde A Peterson, manager of the tooling unit of Boeing Aircraft's Pilotless Aircraft Division, manufacturing, has been transferred to the weapon-system installation section of the field operations department.

H Henry Sinason, formerly works manager of Modern Alloys, Inc, has joined Lobeck Casting Processes Inc, New York, as technical manager succeeding **Gerd Beckmann,** who has resigned.

Lloyd C Preston, sales engineer in the Cleveland territory for Aeroquip Corp, has been appointed factory manager of the firm's Industrial Division's manufacturing plant in Van Wert, Ohio.

Robert E Brooker, formerly vice president of Sears, Roebuck & Co in charge of factories, has been named president of Whirlpool Corp, Chicago. He succeeds **Elisha Gray II,** named chairman of the board and chief executive officer.

J R Reinsma, general service manager of the Alemite and Instrument Division of Stewart-Warner Corp, Chicago, has been named manager of industrial sales of Alemite lubrication products.

L W Adams has been named manager of V-belt sales for the Goodyear Tire & Rubber Co, replacing **J F Taylor** who has retired. Mr Adams, formerly southern region sales manager for Goodyear's Industrial Products Division, will operate from the firm's belting plant at Lincoln, Nebr.

Archie K Beard has been appointed general sales manager of Turco Products, Inc, Los Angeles manufacturer of chemical processing compounds.

Stephen A Busch has been appointed director of manufacturing of Waldorf-Instrument Co's Fluid Systems Division, Huntington Station, LI, NY. Prior to joining the firm he held a similar post at American Machine & Foundry's Buffalo plant.

E R Dooley has been appointed manager of Belfab Corp's new plant at Daytona Beach, Fla, engaged in production of Precisioneered bellows. Mr Dooley was formerly production manager of IBM's Rochester, Minn, plant.

Kenneth W Donle has been named chief engineer of Tube Reducing Corp, Wallington, NJ.

E W Schoen, previously associated with Ford Motor Co, has joined Huck Manufacturing Co, Detroit, as chief metallurgist.

Dr William H Duerig has joined Midwestern Instruments, Inc, Chicago, as vice president, research and engineering. He was formerly associated with Electro-Mechanical Research, Inc, Ridgefield, Conn, where he managed the Engineering Research & Development Division.

OBITUARIES

Dr Vsevolod N Krivobok, 65, authority on stainless steels, died in New York May 17. He was supervisor of the stainless steel and heat resistant alloy section of International Nickel Co's development and research division. Before joining the firm in 1944 Dr Krivobok had been director of research and chief metallurgist at Lockheed Aircraft Corp in Burbank, Calif.

James D Glenn, 52, former vice president and general manager of sales for Crucible Steel Co of America, died May 8 in Pittsburgh.

. . . Feeds Bars, Rods, Tubing Continuously to your Machine Tools. Lipe Automatic Magazine-Loading Bar Feeds have boosted output well over 100% in many applications! Air-operated, they automatically feed a continuous supply of bars, rods or tubing to any machine which can be equipped with a feed-length stop. They will boost production on all the machine tools shown here.

Turret Lathes

Centerless Grinders

Cold Headers

Automatic Screw Machines

Thread Rollers

Punch Presses

NO TIME LOSS with A.M.L. Bar Feed!

- Allows quick set-ups with no tricky adjustments
- Feeds any length in one feed . . . no repeat motion
- Ejects remnant automatically . . . no shutdowns for remnant removal

Lipe Bar Feed experts will be glad to tell you: whether bar feed is applicable, how much it will save, how long to amortize cost. Our booklets and data sheets give further information. Send for your copies.

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SYRACUSE 1, N.Y.
Manufacturers of Automotive Clutches and Machine Tools

What is done is DONE... on the GOSS & DeLEEUW

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW PRODUCT QUALITY

GOSS and DeLEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Round Table...

PART-TIME OLDSTERS

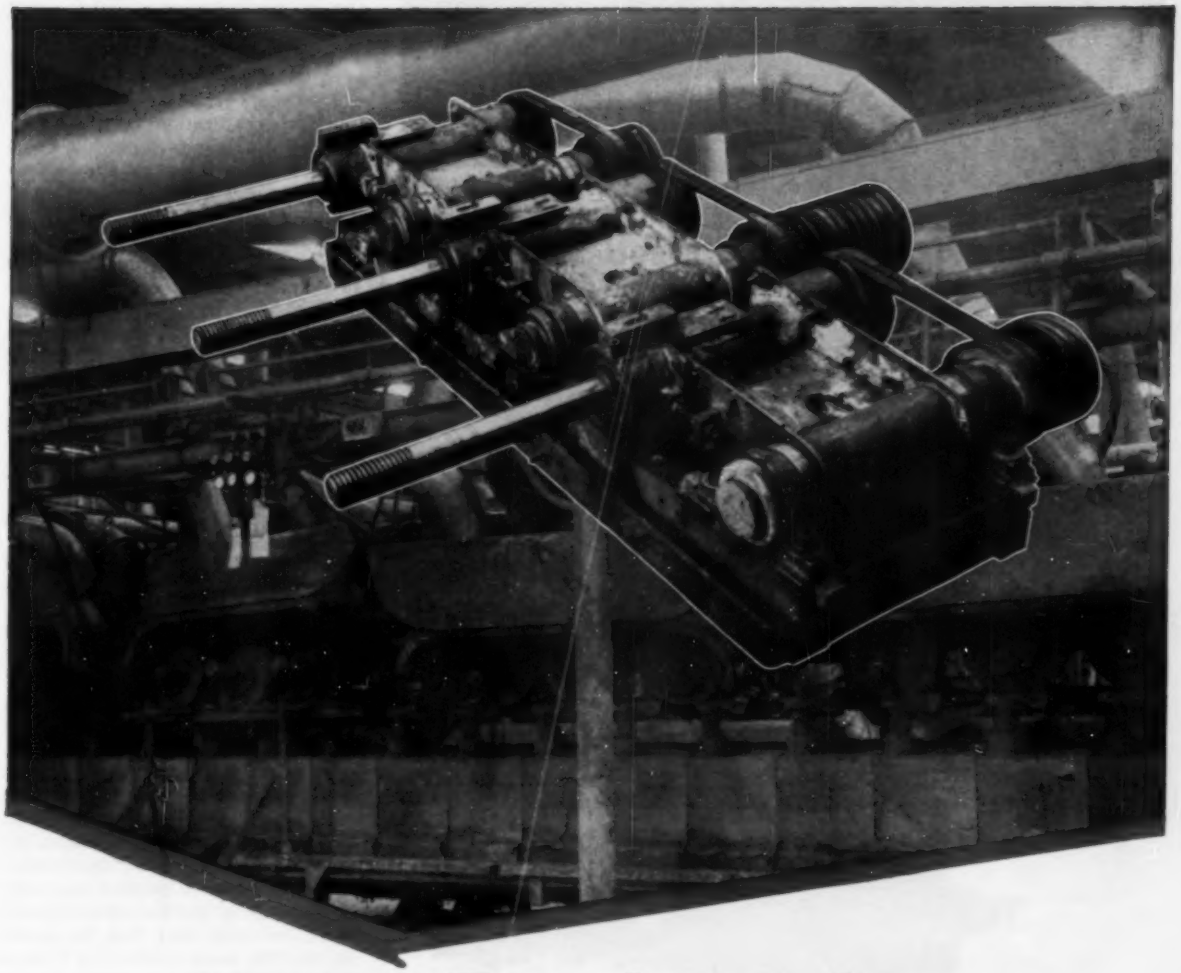
Is it feasible to hire men who have been retired from the shop because of age, and put them back to work on temporary jobs, or during vacation periods? Can't they fill in more than adequately on occasions?

How old is old? Some people take parachute jumps and ten-mile walks in their ninth decade while other folks find it difficult to ambulate around the corner after they reach their fiftieth year.

Child doctors know that there are precocious children who are very advanced for their years and there are some whose work falls behind that of the other youngsters of the same chronological age. Such facts do not mean that one individual is normal and the other is abnormal. They simply mean that some have a greater capacity than others. This capacity is carried with us as the years creep up. One man will retire at the first possible chance and the next will hold on as long as the law permits.

Whether or not a pensioner should be allowed to return to his job on a part-time basis depends entirely on the individual situation. In all probability the willingness to go back is an indication that he is up to the task. Social workers find that members of the golden age club have a tendency to complain about their ailments and their inability to get along. This, of course, is not always the case. When we do come across an oldster who wants to work and attempts to do something constructive in this regard, apparently he feels

"You're gonna buy the cokes! We bought the last time!"



Here's a Bearings, Inc. idea that saved our customer $3,000 in labor, maintenance and parts in 7 months

Only an authorized bearing distributor such as Bearings, Inc., with the experience and facilities we have at our disposal, could have designed and supplied the special housings that hold the flinger sealed bearings that now have effectively solved this difficult bearing maintenance problem.

A well known automotive stamping plant designed and built this tandem buffing head (shown above) for its own use. Due to the extremely high concentration of metal dust from the buffing and polishing wheels conventional bearings had a very short life. Over 300 bearings were purchased in 7 months. Downtime due to bearing failure was very costly. The actual labor and material cost of replacing the bearings during this period exceeded $3,000! Since the new bearing units designed by Bearings, Inc. (shown enlarged) were installed, no bearing failures have occurred and no replacements have been installed.

Remember Bearings, Inc. when you need replacement bearings — Get "factory fresh" bearings of latest design and manufacture. We are *authorized* to sell most famous makes of bearings. We sell *only* those we are authorized to distribute. Call the Bearings, Inc. branch nearest you!

Providing bearing service in the North ➤ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Bolanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
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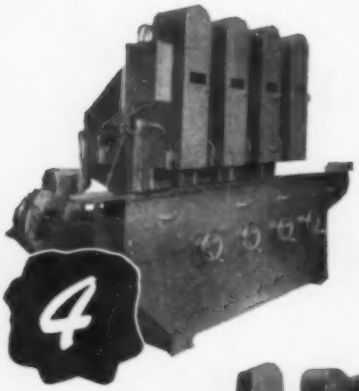
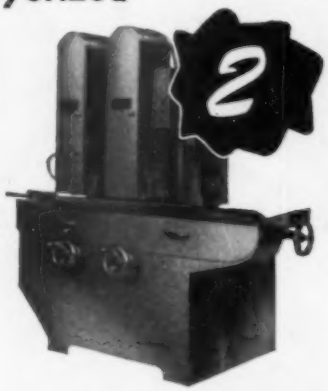
FAST . . . ECONOMICAL . . . VERSATILE . . .

ENGELBERG

Multiple-Head, Conveyorized Abrasive Belt Grinders



FOUR-HEAD GRINDER Finishes four operations in one-fourth the time.



TWO-HEAD GRINDER For two operations in one pass.

SIX-HEAD GRINDER Performs six operations in a single pass.

Pioneered and developed by Engelberg, the multiple-head, conveyor-type abrasive belt grinder is the modern production method of stock removal and finishing. Machines are available with from one to six or more heads.

From rough grind to final polish in a single through-feed pass the Engelberg groups finishing, sizing and polishing operations which might otherwise require several machines and operators.

Parts can be conveyorized or hopper-fed to machine's conveyor belt, and automatically ejected. Minimum set-up and change-over time add production dividends in both short and long run operations.

Whatever your grinding need, you'll find an Engelberg machine to fit it.

SEND FOR YOUR COPY of this Free Book: "How Abrasive Belt Grinding Increases Production at Lower Cost."

ENGELBERG, INC.

Precision **ABRASIVE BELT GRINDERS**

186 SENECA STREET • SYRACUSE, N.Y.

that he has the wherewithal to carry on. The chances are that he has not yet reached the retirement stage even though he is of retirement age.

Putting a certain number of years into an organization is no dictum that he is ready to leave the company. Al and Ed might have both spent 25 years in the same shop but if they started at different ages, on their silver anniversary Al might be 65 years old while Ed might only be 45 years of age. Ed would still have many more good working years ahead of him but he may choose to follow another routine for a change. Perhaps he had been looking forward to doing more work around his property or to spending extra time with his family or maybe he never saw fit to take off three or four days during the week to do things that couldn't easily be accomplished on week ends. People who have only been working five or ten years could think of plenty of worthwhile activities that would occupy their time if they didn't have to punch a card twice or four times a day.

A man reaching his time of retirement happens to be in a position where he can do what we all dream of doing, he can call his time his own. If it is his pleasure to continue doing his life's work, but in a lesser degree of quantity, there is no reason why this must also be in a lesser degree of quality. Indeed the quality may even improve because his weekly schedule is diversified enough to make the short time that he spends on the job more interesting to him than that of the worker who has to report to the same surroundings, day

"I need a raise because my expenses have doubled, including gift collections for all my fellow workers who left because they didn't get raises."

after day, week after week and year after year.

Let us not take our orders from the calendar, but rather let's let our conscience be our guide. Let us hire the man who can do the job, whether he be young or old.

Perry G Conway
Philadelphia· Penna.

RETIREMENT age means the age to retire. When an employee reaches this milestone in life he should be ready to leave the shop with fond memories, and without regrets.

When a company permits even one employee to remain on the payroll on a part-time basis after retirement, it is establishing a dangerous precedent. Such an arrangement, unless extended to all, will create hard feelings, bitterness, and resentment. Retirement should be a day of happy transition, transition to a new stage of life. It can be such a day if proper plans and preparations have been made during the working years.

As with so many things in this life, success depends upon preparation. The shop that permits one or more retired employees to continue to work on a part-time basis makes planning for retirement difficult. Each employee will feel that this privilege will also be granted to him when he retires. Many things can happen before he retires, but man has a way of rationalizing that which is only a hope into a firm belief. Many employees will face the disappointment of being refused a part-time position. This can be a serious blow to their plans if they had included this activity and income in their calculations.

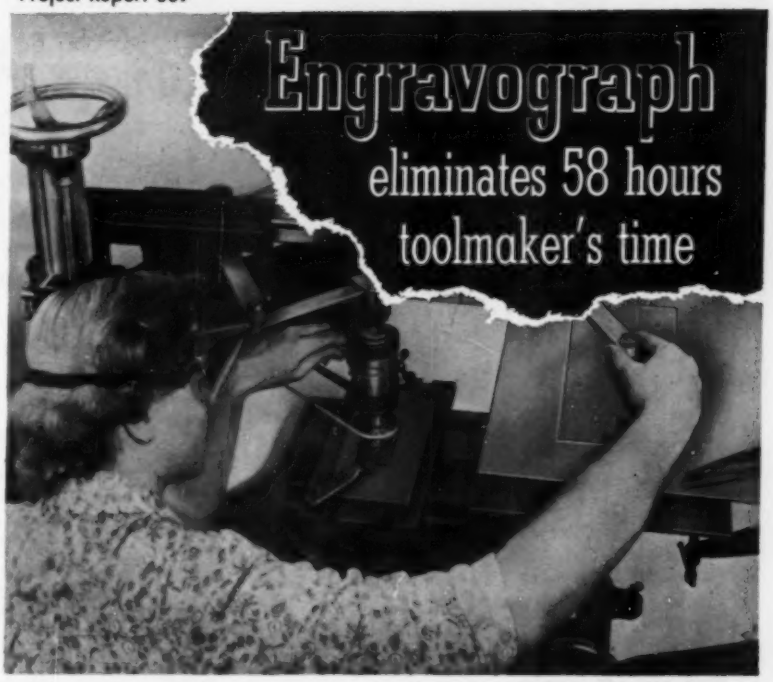
The years after retirement can be good years; they need not be empty. Studies have uncovered the conditions that can cause old age to be unsatisfactory. Sound planning based on these studies can assure a worker of a varied, interesting life after retirement.

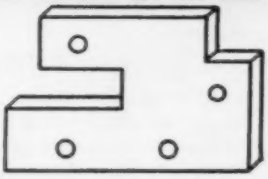
Henry George
Yonkers, NY

INDUSTRY CAN NOT only use the services of the retired man on a part-time basis efficiently, but in some cases I know of there are retired men who are willing and eager to get back into harness if only for part of the work week.

Some of them miss the shop contacts and the feeling of being part of things, but to put it bluntly most of them have financial obligations that did not stop on the day they became

Project Report 309





Problem: To cut a shape and drill 4 holes
Material: .050 aluminum
Quantity: Approximately 500 pieces

Conventional die and jig methods require 40 hours toolmaker's time to make the die, and 18 hours for the drill jig. The run would entail two handling operations, first stamping, then drilling holes.

Engravograph method: Make one master (approx. 4 hours). Use ENGRAVOGRAPH Model H to profile the shape, spot and drill the holes in one operation.

In addition to eliminating tooling costs, the ENGRAVOGRAPH itself is a fraction of the cost of either of the two machines that would have been tied up, and can be operated with top efficiency by SEMI-SKILLED or UNSKILLED labor.

Where tooling costs are top-heavy in relation to production quantities, management engineers find it pays to look into ENGRAVOGRAPH, the tracer-guided engraving machine. If you have a machining, profiling, or engraving problem in your plant, our engineering department will be glad to help you select the right equipment. Send us your drawing or sample.

Model H $998.00

OTHER ENGRAVOGRAPH USES:
- Pantographic drilling of printed circuit plates
- Engraving of
  Dials Panels
  Stencils Nameplates

Request our 28-page fully illustrated catalog AH-1 on your business letterhead.

new hermes ENGRAVING MACHINE CORP.
13-19 University Place, New York 3, N.Y.

ALLEN-BRADLEY *Quality* Reduced Voltage Motor Starters

AUTOMATIC GRAPHITE RESISTOR TYPE

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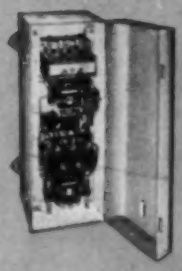

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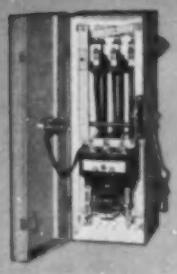

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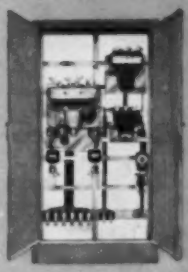

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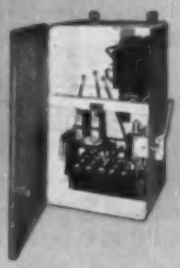

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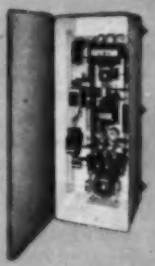

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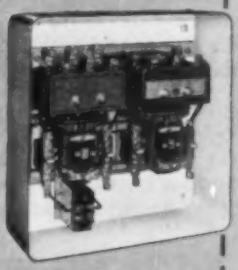

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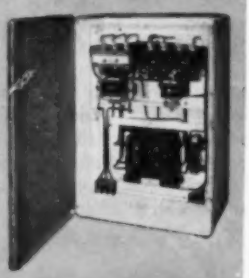

A-B QUALITY

The Sign of QUALITY Motor Control

ALLEN-BRADLEY MOTOR CONTROL QUALITY

Allen-Bradley Co., 1315 S. First St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

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So far as the complications of insurance coverage, timekeeping, compensation, etc, are concerned, these are matters that can be adjusted if the will to do so exists. Insurance, particularly, is held up as a bugaboo whenever the employment of the older worker is considered. Many of these older workers were employed during the war years. I can't recall any instance of an employer or insurance company going broke on account of it.

Robert Alexander
Glastonbury, Conn.

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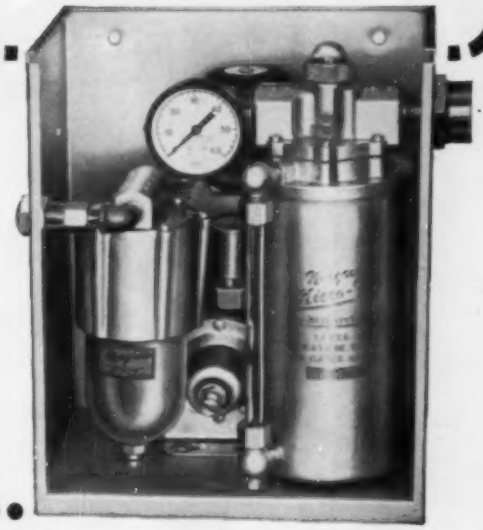
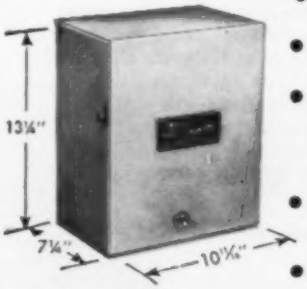


NEW...

Compact, Tamper-Proof Cabinet Units

lubricate all bearings, gears, chains and cams on a machine

These new Norgren units provide ideal lubrication by applying just the right amount of air-borne oil fog to all bearing surfaces. The standard unit includes an automatic-drain air line filter, a solenoid valve, a pressure regulator, a pressure switch and a MICRO-FOG Lubricator... *and provides the following important advantages:*



1 QT. OR 2 QT. OIL CAPACITY
200 OR 300 BEARING INCH RATING

- **TAMPER-PROOF**—Totally enclosed key-locked cabinet prevents tampering.
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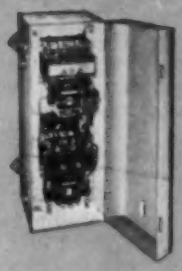

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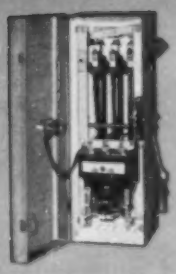

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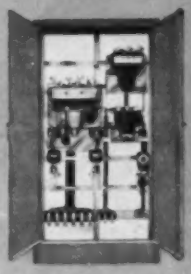

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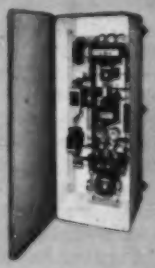

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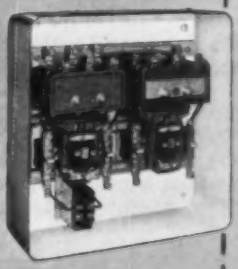

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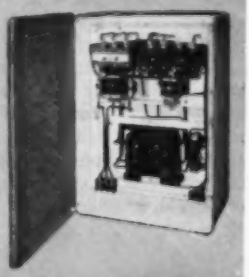

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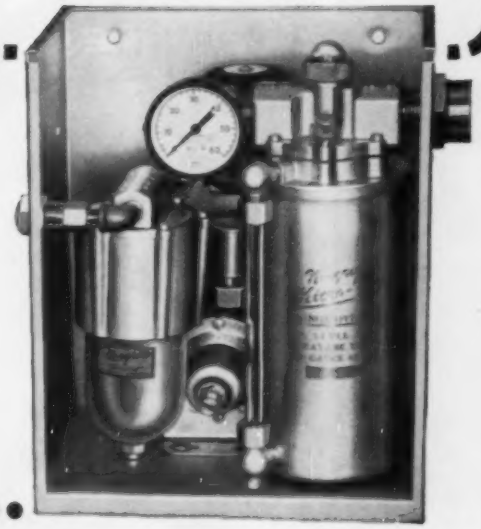

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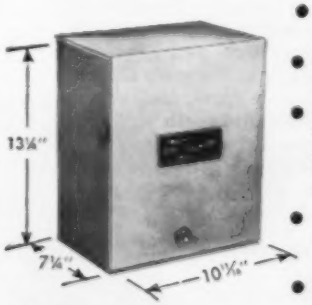

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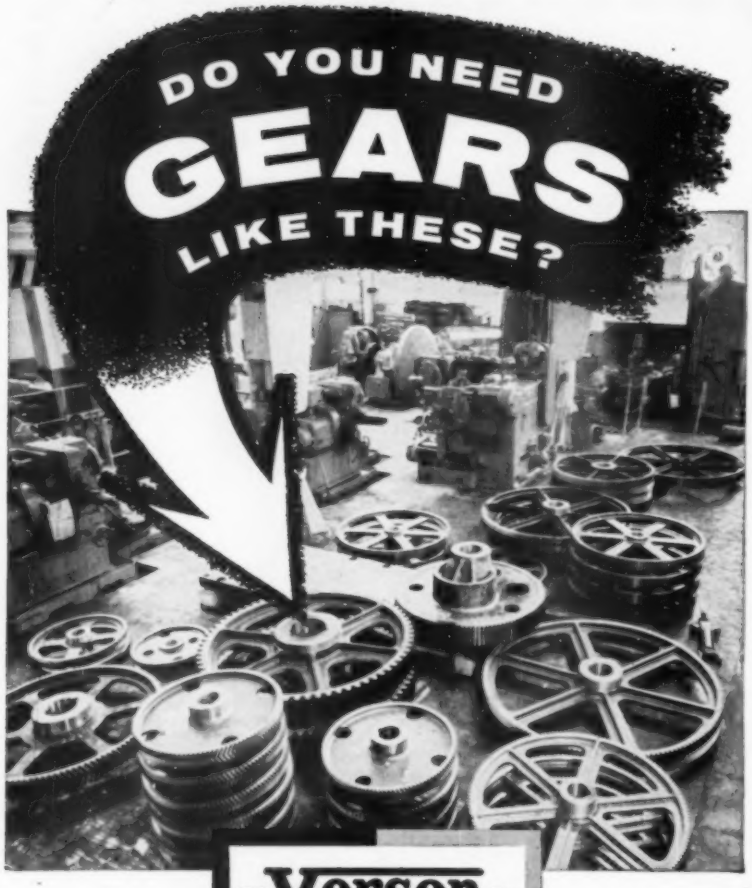

will fabricate and cut them for you

Faced with a gear job you can't handle? Facilities tied up on other work? Requirements exceed the capacities of your machines?

Verson is equipped to do the job for you and will handle the work on a contract basis . . . quickly, efficiently and economically.

Shown above are a few of the many medium and large sized gears being fabricated and machined daily at Verson's Chicago plant. In addition to herringbone and spur gears, facilities are also available for the complete machining and teeth cutting of internal and bevel gears, pinions, worms and worm gears.

Verson also offers facilities for the fabrication and machining of light and heavy weldments. Whatever your requirements, it will pay you to talk to Verson first. 180

GET THE COMPLETE VERSON STORY

Send for Bulletin F-57, a colorful 32-page book illustrating and describing industry's most modern facilities . . . for contract weldments . . . for contract machining . . . for contract gear cutting . . . for press rebuilding. Here's a behind-the-scenes look at Verson . . . a complete organization with all the facilities, know-how and experience to do your job right.

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MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES
TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

what purpose? To enable the employer to draw interest on some easy money.

I'll agree that the company should have some insurance for the tools it lends out to the workers. Let 'em take out insurance to cover possible loss through regular channels and not in a way that makes every man feel that he is a crook. Are we getting to the point where we have no faith in mankind anymore? How many new men "take off like birds"? If any, a mere smattering, and then for some reason other than a damaged job.

How much time do you need, Ed, to check up on a man's work to see if he is worth keeping or not? Have you no confidence in the man at all, or has some slicker pulled a fast one on you in the distant past and made you callous? If the man says that he can do certain kinds of work, take his word for it; you've put money on slower horses. If the man can't do the work, he'll let you know.

If we go around thinking that a new man is a risk instead of an asset we certainly are going to create anything but optimism. I don't see where Ed can rate hold-back pay as being a savings account. Why don't you let the man do his own saving —it's his money and it's none of the company's business what he does with it. The first thing you know you're going to try to tell your men what to eat. Let them live their own lives so long as they do the work you hired them for. Then again, how do you expect a man to save anything the way things are going today? Every time you go to a supermarket for some eats you'll find a cent or two tagged on to almost

"Mr Quinton, I want to report a Jack-The-Zipper!"

everything. It's getting to be a national pastime.

I agree with Al that the holdback deal is a crummy suggestion and I can see no reason for doing it. And listen, Ed, oldtimer, why should I feel inclined to stay on a job just because my employer held back a week's pay? That idea is nuts. I'd be more inclined to quit because I know that if I did I'd have a fist-full for a while.

You know what Harrison will say when Ed puts the proposition to him? He's going to give out with a big laugh and then tell him to get his mind back where it belongs—take care of his regular job and quit piddling around with screwy ideas.

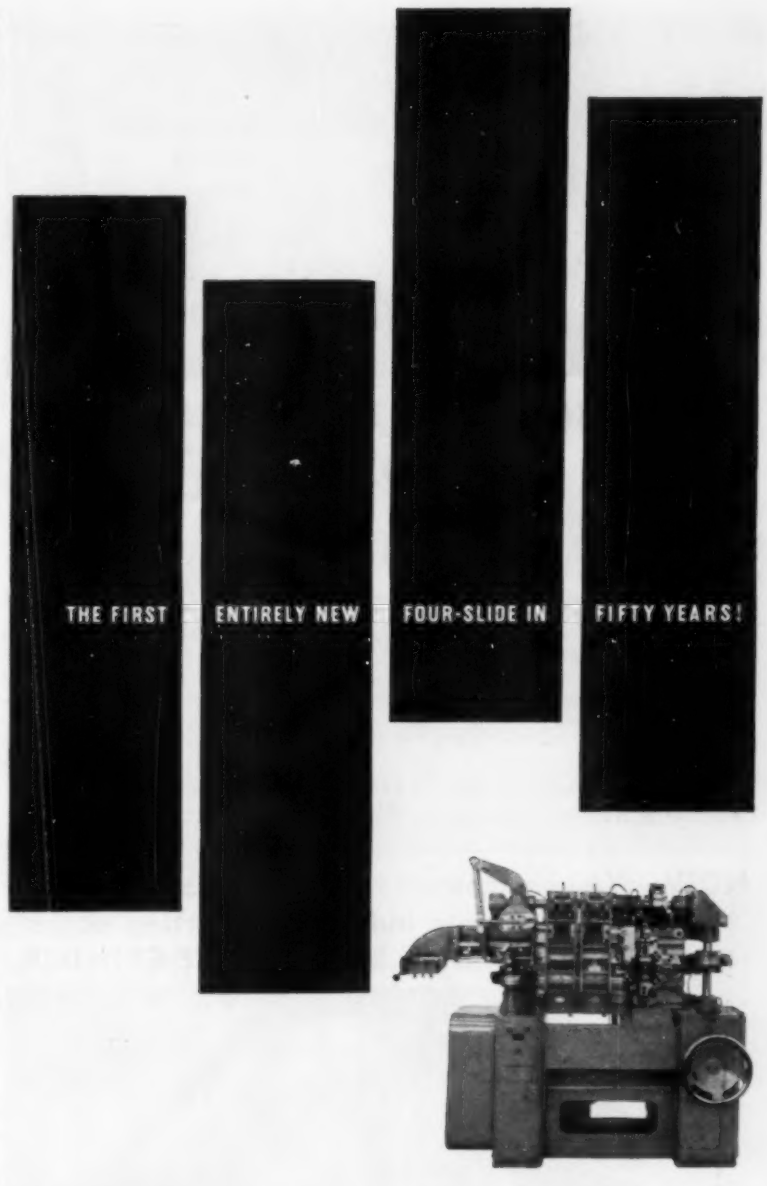
Jack Everett
San Francisco, Calif

Ed's idea of holding back a week's pay is not new by any means. I've gone to work in many a plant where two weeks' pay was held in reserve for contingencies. This was done mostly to take care of tools furnished by the company and to cover possible damage done by an unknown employee. I do think that two weeks is stretching it a little too much.

Why it is that a man should conduct his affairs so close to the red is hard to understand. It only goes to show that he needs assistance to make him see the folly of his ways. It evidently is the result of living it up, as the saying goes, and not making any provisions for an emergency. So long as industry countenances such economic folly I cannot see where the worker is going to make an effort to improve his station, financially.

As a means of combating this dependence of living in the future, I am in accord with Ed's plan of holding back a week's pay. It may be a little rough—and indeed I found it considerably so—to have to wait so long for the first pay envelope or check but at the termination of my service I had the benefit of the holdback. Like most individuals I had a splurge before landing another job and found myself in the same hole again until my first payday. All we can say about the situation is that it is human nature and do what we can to improve it.

Let us look at it from the employer's standpoint. He takes on a new man of whom he knows nothing. Before the man has been tried out he is given a rate of pay to start. The employer has considerable amount of valuable machinery and tools which he will entrust with the new



A development of industry-wide importance is the Torrington Verti-Slide—a new vertical 4-slide that is the first major innovation in the basic field of wire and strip forming equipment in half a century!

The Verti-Slide was designed to meet a serious need for greater versatility, lower tooling cost, faster set-up time and reduced floor space. We urge you to investigate the new Torrington Verti-Slide in detail.

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO

Six machines protected from dust by Torit for $666.15

This Torit Dust Collector, Model 219FM, was installed by the Mohr Lino Saw Co., Skokie, Ill., to protect 3 belt sanders and 3 other grinders (2 grinders hidden from view) from destructive dust. Total cost of collector *plus* all accessories was an astonishingly low $666.15!

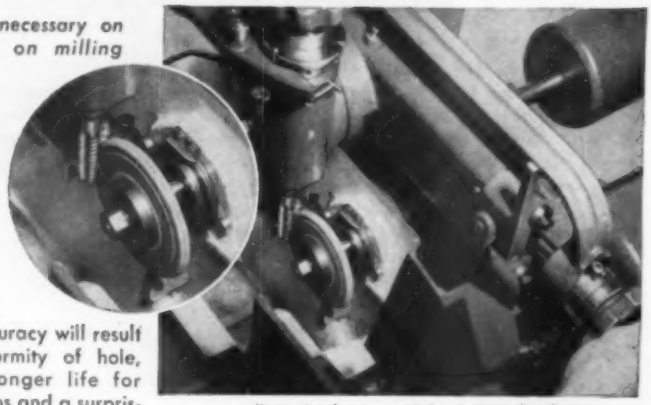
After one year's operation, Mohr Lino Saw says this about their *low-cost* Torit installation: "Our Torit installation has proved efficient and economical—an excellent investment because it has kept our shop *cleaner*, our operators *happy*, and *protected vital* machinery."

Just as Mohr Lino Saw Co. did, you can achieve greater machine protection and cleaner working conditions by trapping dangerous or valuable dust *at its source* with a completely *self contained* and *portable* Torit Dust Collector. For full details on Torit's complete range of types and sizes, write to . . .

TORIT MANUFACTURING CO.
Dept. 406, 311 Walnut Street, St. Paul 2, Minn.

NOW – You can control rake or hook angle and insure accurate indexing of cutting edges* of taps with the BLAKE FLUTE GRINDER.

**Just as necessary on taps as on milling cutters.*



This accuracy will result in uniformity of hole, much longer life for your taps and a surprising savings in tap costs.

Keep it sharp — Make 1 tap do the work of 6 with The Blake Flute Grinder.

Write for bulletins on BLAKE Tap Sharpening Machines

EDWARD **BLAKE** COMPANY INC.
MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS
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Exclusive Distributors of:
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man. While it seems foolish to put valuable equipment in the use of an unknown employee it isn't always possible to avoid it. If the new man is bonafide, and has not misrepresented himself, the chances are that he may perform satisfactorily. There are others, fortunately in the great minority, who have succeeded in hoodwinking the personnel into believing that he was a lucky find—even to making the foreman feel that he had a good worker. Because the foreman cannot keep his eyes on everything at once the smooth operator manages to put in many hours before the truth comes to light.

There is no doubt in my mind that if the company were to announce that it was going to institute a system of holding back a week's pay, and it was to apply to all employees, it would stir up a bee's nest. I wouldn't blame the men one bit if they did go on strike for such an imposition. However, were the company to carry out such a plan upon the employment of new workers it would reap no hardship on the old employees. In order to assuage the new workers the thought comes to mind that the company could set aside an equal amount to apply toward an emergency fund which the new man could avail himself of in the event of dire need. This would soothe the pain of the holdback as well as to act as an incentive to stability—we need such.

John Homewood
Laguna Beach, Calif

ED IS HEADING for trouble with the union in suggesting holding back one week's pay; this he should know if he has any experience at all with labor problems. No more than enough time to figure out the previous week's paycheck should hold back the guy's pay. This is often

"Checked your battery water lately?"

NEWS from American Chain:

ACCOLOY KUPLEX Sling Chains...

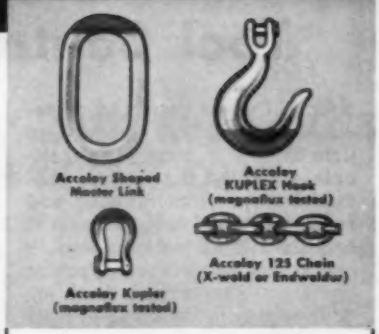
Fast assembly—quick delivery from your Kuplex distributor

The ACCOLOY KUPLEX is the first and only sling chain completely engineered as a unit that is quickly available in whole or in part from Authorized Distributors. Made up entirely of matched and engineered components, each part is designed and manufactured specifically for use with all other parts of the complete KUPLEX Sling assembly. It is a streamlined sling chain that greatly reduces the possibility of snagging on other objects.

All parts are made to ACCO *Registered* Specifications from heat treated ACCOLOY steel, and are engineered to be as strong as the chain itself. All are factory proof-tested to twice working load limits. Hooks and Kuplers are magnaflux-tested. These facts are covered in a CERTIFICATE OF TEST issued by ACCO and signed by the distributor with each complete sling purchase.

Fast Service from Distributors' Stocks • An ACCOLOY KUPLEX Sling gives you an assurance which is lacking when you use homemade slings of questionable reliability. It gives you new parts for worn or damaged slings without delay. Thanks to the fast service available through a nearby distributor, you can be assured of having the sling you need when you need it. This also means that your inventory investment in sling chains can be held to a minimum.

Write our York, Pa., office for the name of the Authorized KUPLEX Sling Chain Distributor nearest to you.


Accoloy Shaped Master Link
Accoloy KUPLEX Hook (magnaflux tested)
Accoloy Kupler (magnaflux tested)
Accoloy 125 Chain (X-weld or Endweldur)

SIX SLING SIZES WITH THESE FOUR COMPONENTS

• A nearby Authorized ACCOLOY KUPLEX Sling Distributor can furnish promptly from his stock the exact sling chains you need for your specific requirements; made up from the components shown above. Six chain sizes (¾" through ⅜") are available in single, 2-leg, 3-leg or 4-leg styles.

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Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

**Indicates Warehouse Stocks*

ACCO

TRADE MARK

Now! Stop Costly Waiting at Tool Crib...use McCaskey Tool Control System!

Now . . . newly developed procedures in McCaskey's famous Tool Crib System . . . completely eliminate time lost by highly paid machine operators drawing and returning tools. Crib attendants prepare kits of tools for jobs or operations in advance. Machine operators simply pick them up or they may be delivered to their machines.

Newly designed tool orders are quickly written by crib personnel, by operators at machines or crib or both. Result: No wasted time at tool crib . . . more working time at machines . . . increased machine productivity.

The McCaskey System reduces tool purchases by cutting crib inventories. Reduces tool breakage, loss and theft. Cuts cost so many ways it pays for itself in a few months.

VICTOR

McCASKEY INDUSTRIAL CONTROLS

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three days with payday on Wednesday.

It is true that a lot of companies practised the idea in the old days, but it is impossible to go against the trend of a short paycheck-figuring-period that is common today. If any firm loses money because a fellow runs off without returning the company's tools the organization is to blame. No final paycheck should be given any man without checking his tool account at the toolcrib.

Although it is a good thing for any man to have two weeks' pay unspent when leaving his job, the holding back of one week's pay probably cannot be enforced without an agreement with the union. To dictate a decision of that kind is very unwise.

It is up to the foreman in a small shop or the checking department in the large factory to check everybody's jobs and find out whether the work turned out is good or scrap. This cannot be delayed several days as Ed seems to think.

It is out of date to try to practice different rules for those already employed and the new men hired. I don't think this is a smart idea at all, so I would suggest not to trouble Harrison with it as he probably has more profitable things to consider.

A E Fristedt
Stockholm-Bromma, Sweden

DIGNITY OF THE TRADE

Would a foreman lose the respect of his workers if he stoops to pick up a tool that had fallen on the floor? Is an attempt to preserve dignity outworn today in the busy shops of the country?

DIGNITY is not an inherent property of a person, it is an acquired attribute. It has become an essential component of our social and economic system. It exerts a powerful

". . . They even changed the way I spelled my name!"

influence on our lives and, in many cases, it overrides monetary forces.

Men do not live by, or work for, bread alone. True, remuneration is measured in terms of financial reward, but few men would remain on a job where this was the only recompense. Men seek the esteem of their fellow men, and this factor becomes increasingly significant as their financial position becomes more secure. Men dress themselves and their families, maintain their homes and polish their cars out of pride and dignity. Except for dignity, appearances would not be considered, and practicality would dictate in these matters.

The wise business organization will recognize these basic facts and make use of them in formulating their policies. A sense of dignity and a feeling of belonging have a cash value, and the company that provides them will find the employees willing to work for less.

It is not difficult to provide this dignity, but it does take more than a swept floor and a polished front door. In some of the biggest companies it is sadly lacking. In some small organizations it filters down to every level, permeates every corner. It is infectious by nature, and can creep through the plant and take hold of all there. The company that would succeed should recognize its value and desirability, and do all possible to promulgate its growth.

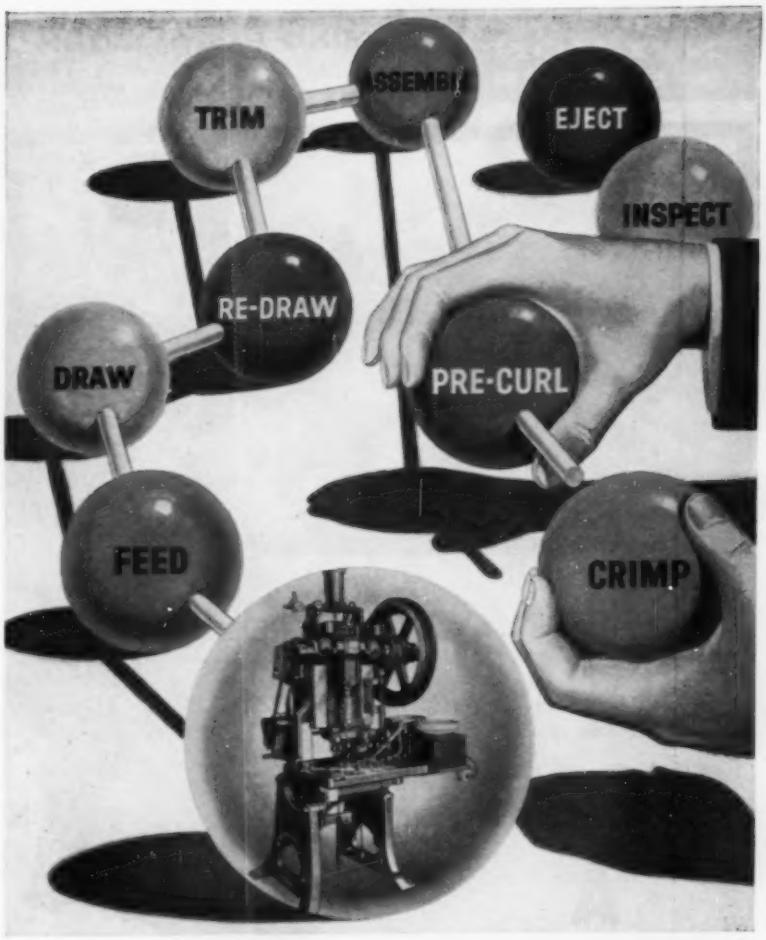
Henry George
Yonkers, NY

"THE DIGNITY of this act was worth the audience of kings." Shakespeare might easily have been talking about the incident where the tool was picked up by someone other than a day laborer.

Any act may be called dignified as long as it doesn't conflict with a person's self-respect and his respect for others. When this act is more than a man is required to do in his state of life, then so much the better. It may even lean toward heroism.

Of course if he is doing somebody else's job, and neglecting his own, that is a horse of a different color. If a foreman has an ulterior motive in occasionally picking up after his men, all right, but if he is just doing it out of kindness the workers may become more careless than ever with the feeling that "George will do it."

Raymond Geraghty
Brooklyn, NY



V & O TURNS IDEAS INTO EQUIPMENT THAT REDUCES DIRECT COST

For example, on the press shown above, a washer and cup-shaped part are automatically fed, assembled, then joined by crimping. By integrating these operations on a single machine, V & O enabled the customer to cut direct costs on this component to a minimum.

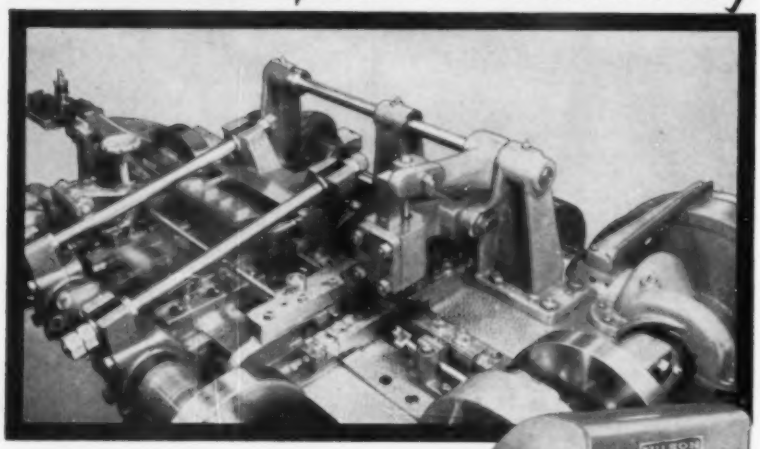
Most important is the fact that this unit consists of a standard-type V & O press, equipped with standard types of vibratory hoppers.

Very likely you have some ideas on how you can cut your direct costs by integrating operations. We would welcome an opportunity to discuss them with you. Chances are that we have built an automated press that, in principle, comes close to your needs.

Presses, special equipment and methods that automatically reduce costs

EMHART MANUFACTURING COMPANY
THE V & O PRESS COMPANY DIVISION
301 UNION TURNPIKE • HUDSON, NEW YORK

NILSON 4-SLIDES FORMING PRODUCTION PROFITS... *Automatically*



WHY Cost-Conscious Companies CHOOSE A NILSON

Every Nilson 4-Slide Forming Machine is designed with built-in flexibility! Most models handle either wire or ribbon metal with equal speed and accuracy . . . can combine stamping, welding and other secondary operations with the basic forming cycle. Easy access to tooling insures rapid setups, minimum down-time for job changeovers.

Whatever your forming application, there's a Nilson 4-Slide to do the work faster, more economically! With 17 horizontal models and the new "Vertiform" machine, Nilson offers you the widest selection of 4-slide equipment.

Investigate the cost-cutting advantages of Nilson 4-Slides in your operations! For a production evaluation of your parts, send prints or samples today.

See these machines in operation at the ASTE Show, Booth 1817

Illustrated at top is Model S-1-F Machine, showing built-in press and open construction of forming area. Directly above is the new Vertiform Machine.

SIZE RANGES:
Wire up to ½" diameter
Ribbon stock to 3½" wide.
Feeds up to 32"
5 TO 75 TON
PRESS SECTIONS

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AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

NEW BOOKS...

WEAR—*A periodical published by Elsevier Publishing Co, Spuistraat 112, Amsterdam-C, The Netherlands. Published every other month; about 76-90 pages. Price: $15.00/yr. Size 6½x9½ in.*

This is a technical journal on wear, bearings, and lubrication, with articles in English, French, and German (mainly English in the first four issues). Content is highly technical, and articles are contributed by authorities in the field, some from research institutions, others from research departments of commercial companies.

In addition to original articles, the magazine includes abstracts of technical papers and articles in other magazines, a calendar of future meetings, and short current-events columns. No advertising is included.

•

MECHANICAL WORLD YEAR BOOK (1958). *Published by Emmott & Co, Ltd, 31 King St West, Manchester 3, England. 254 pages, 4 x 6. Price 4/6 (65¢).*

This 71st edition of a well known British handbook contains an entirely new section on die casting, as well as considerable new and revised material on gas turbines. The data on steam turbines have also been brought up to date because of the increased activity in the field brought about by recent applications of nuclear energy.

•

REPRINT; REINFORCED PLASTICS DIV; SPI—*Published by the Society of the Plastics Industry, 250 Park Ave, New York 17. 1¾ in. thick. Price (combined with Question and Answer Book, recorded during meeting) $7.00.*

This is a bound copy of the papers presented at the Technical and Management Conference, SPI, Reinforced Plastics Div, at the Edgewater Beach Hotel, Chicago, Feb 4, 5, 6, 1958. It includes approximately 80 papers, dealing with physical and chemical tests on reinforced plastics, molding and laying-up techniques, and finished structural products, many of which are pictured. A large proportion of the material is highly technical, but it's a big book and includes a fair amount of information even for those not technically trained in plastics.

SETTING TIME:

10 SECONDS

ACCURACY:

.00005" BETWEEN ANY TWO POINTS IN 12" RANGE

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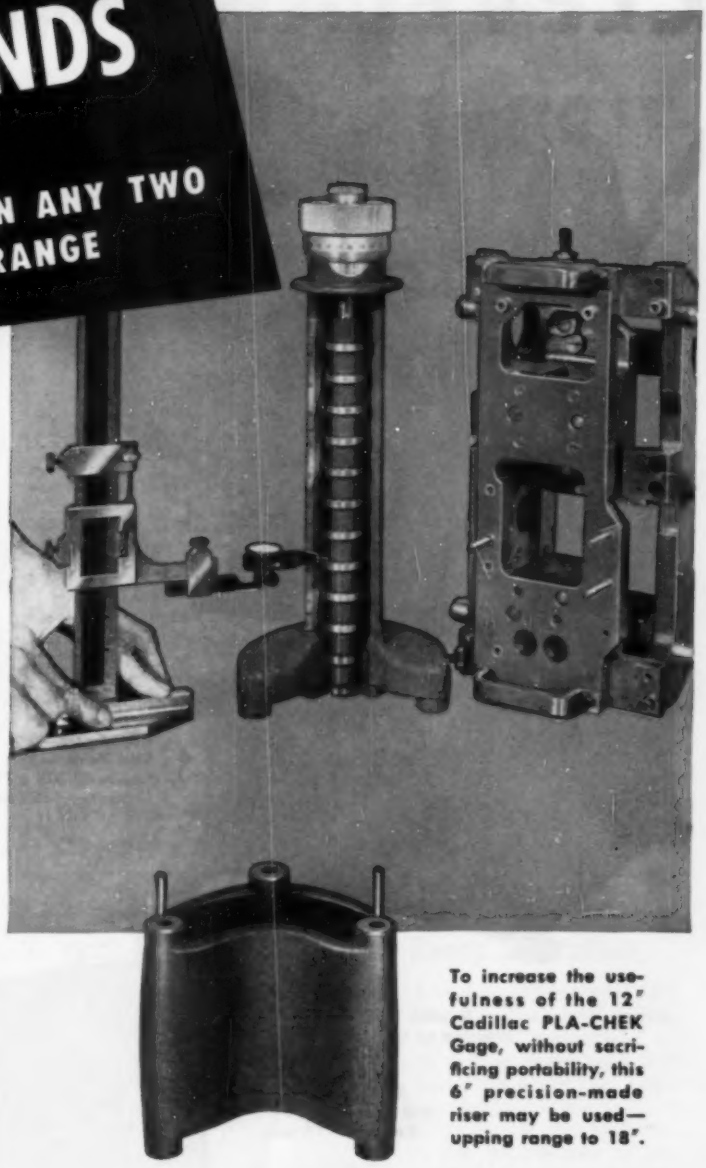
And, accuracy is assured! Between any 2 points in the 12" range accuracy is guaranteed within .00005".

With a reverse checking plate, a height-gage indicator is easily set for checking the underside of parts. Use of inside micrometers, telescoping and internal cylinder gages gives this gage added versatility. Send coupon TODAY for complete details!



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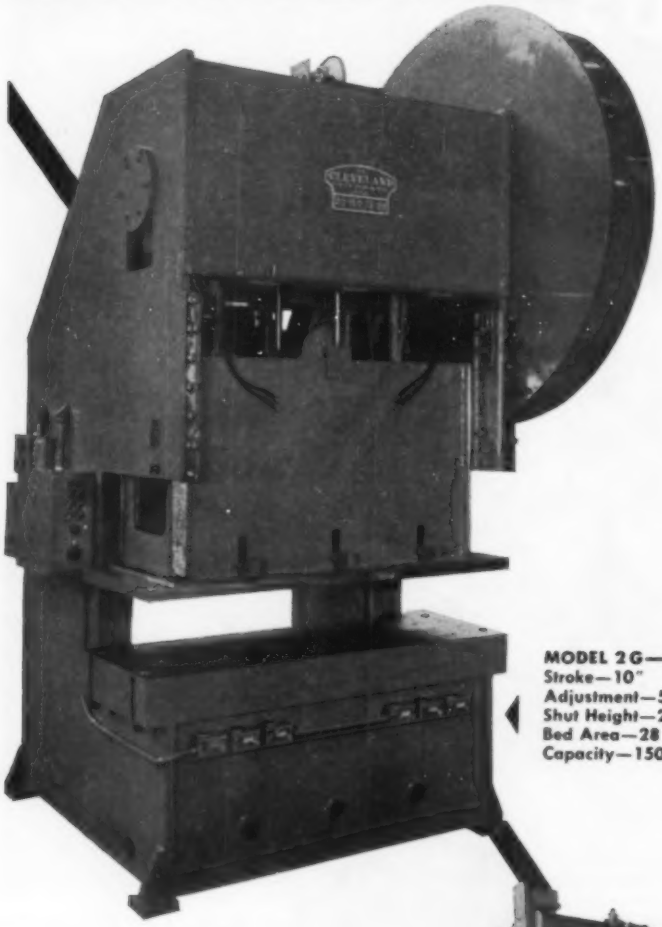
CLEVELAND OPEN BACK GAP PRESS



Designed for automatic feeds and greater convenience in handling large or irregular sheets, Cleveland Open Back Gap Presses are especially adapted for punching, shearing, perforating, bending and forming operations.

Available with single or double crank action, Cleveland's line of Open Back Gap Presses are available in a wide range of sizes and capacities, permitting the working of metal of almost any thickness from light sheet to heavy plate.

You get better stampings for less with a Cleveland Press.

MODEL 2G—150
Stroke—10"
Adjustment—5"
Shut Height—22"
Bed Area—28 x 72"
Capacity—150 tons

MODEL 45G—42—75
Mounted on legs for inclining.
Stroke—6"
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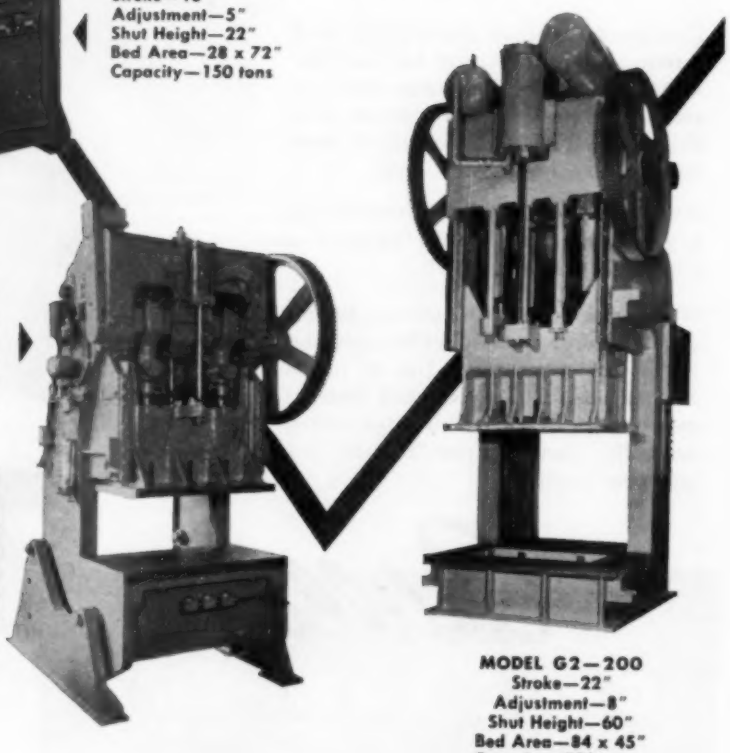
Shut Height—17"
Bed Area—30 x 54"
Capacity—75 tons



MODEL G2—200
Stroke—22"
Adjustment—8"
Shut Height—60"
Bed Area—84 x 45"
Capacity—200 tons

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Established 1880

Power Presses
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Punching Tools & Dies

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TOP TOOLING
will squeeze more profit from your present production

Leading tool engineers agree that the metalworking industry loses thousands of dollars annually through improper tools and techniques. These losses have often been due to tight production schedules and have been hidden by large volume production. But now it's time to TOP TOOL . . . to cut costs all along the line to squeeze the greatest possible profit from every order. It's time to get rid of old, outmoded tooling that requires large investments in inventories and costly regrinding. TOP TOOLING with Kennametal* is helping many companies improve their profits today . . . get ready for stiffer competition tomorrow.

Here's proof . . .

During nine months in 1957, a well known Eastern manufacturer recorded savings in excess of $94,000 . . . from an investment of less than $25,000 in Kendex "throw-away" insert tooling. In addition to direct production savings, the change to Kendex provided several side benefits. For example, instead of 28 men in the Grinding Department, the company now needs only six, and job setters no longer have to wait for tools to be resharpened. As another benefit, only 4 to 6 grinding wheels are used per month, compared with 30 to 40 as formerly required. At $50 each, the company is saving $1300 to $1700 every month on grinding wheel costs alone.

With the former tooling setup, the company maintained a 3-month inventory of 25,000 brazed tools. On most jobs now, with Kendex multiple operation tools, only the inserts need changing, and a stock of 5,000 turn-over "throw-away" inserts are sufficient for three months.

Records of this company afford factual proof of how Kendex Tooling and the Kennametal Tooling Service can effect savings within *your* plant. Learn how today. Call your Kennametal Representative or write KENNAMETAL INC., Latrobe, Pennsylvania.

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3103

Here are 3 ways KENNAMETAL can help you TOP TOOL

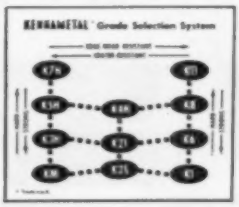
1. With Kennametal Tooling Service

Helping you get the right tools for machining at a profit on every job is the Number 1 assignment of your Kennametal Representative. Your knowledge of the shop and job requirements, plus his thorough knowledge of Kennametal Tooling, add up to give you Top Tooling that pays off in profit.

2. With the Right Grade for Every Job

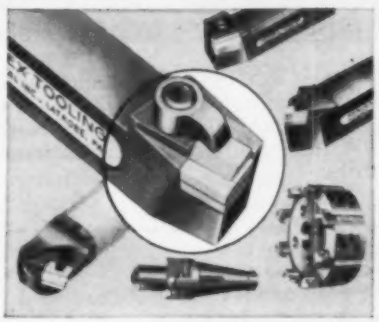
Once a Top-Tooling Study has established your exact requirements —the comprehensive Kennametal line will provide a time-tested grade for each job.

General purpose needs can be satisfied from Kennametal Group I, which was recently expanded by the addition of grades K4H and K2S. By moving these grades, previously classed as "premium," into the General Purpose Group, Kennametal now provides a selection of low-cost grades suitable for a wide variety of jobs —and has opened the door to further savings through cuts in inventory costs.



For the ultimate in performance on specific jobs, Group II provides a grade selection tailored for specialized operations —for today's high alloy materials, closer tolerances and higher cutting speeds.

3. With the Right Tool for Every Operation



Kendex offers you the world's most complete line of standard toolholders . . . 42 holder styles and 222 tools. But when Top Tooling requires a "special" . . . Kennametal can make it. A few adaptations of the Kendex turnover "throw-away" insert principle are shown at the left.

Let your Kennametal Tool Engineer help you plan a Top Tooling program that will help you squeeze more profit from every job today . . . and be ready for stiffer competition tomorrow. Call him now, or write KENNAMETAL INC., Latrobe, Pennsylvania.

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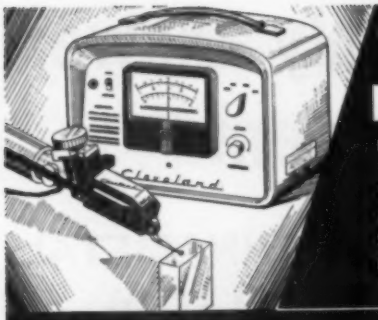

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HEIGHT GAGE

Measures in thousandths, ten-thousandths or millionths of an inch.

The Cleveland INDI-AC is the only indicating height gage which protects the gaging element from accidental blows in any direction.

More INDI-ACs are sold than any other electronic height gage.

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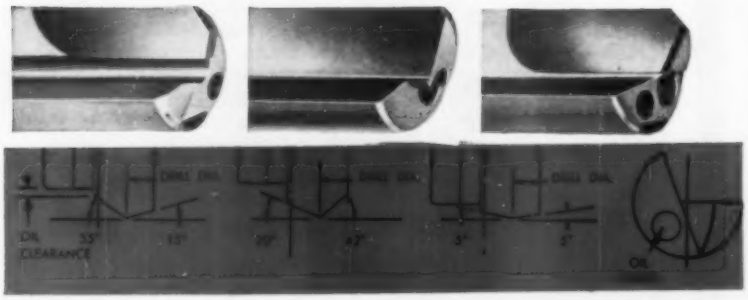
R-O RELIEF ALSO...

makes gun drills last longer, cut better and perform more consistently!



Not only does the R-O permit exacting control and duplication in grinding gun drills but it grinds cam relief from edge to heel leaving maximum metal to support the edge and no feather edge to break down. Write for literature and instructions on how to grind gun drills.

RO
UNIVERSAL FORM RELIEVING FIXTURE
R-O Grinder

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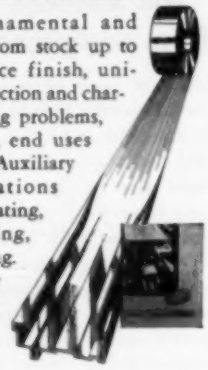
FREE YODER BOOKS OFFER *"KNOW-HOW"* on • ROLL FORMING • TUBE MAKING • SLITTING

COLD-ROLL FORMING

Structural, ornamental and tubular shapes from stock up to ½" thick. Surface finish, uniformity, stock selection and characteristics, plating problems, production costs, end uses and applications. Auxiliary automatic operations including perforating, notching, welding, coiling, embossing. 88 pages, fully charted and illustrated.



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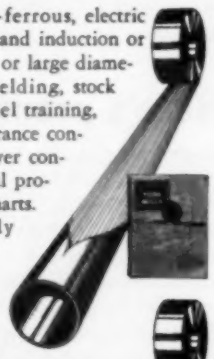

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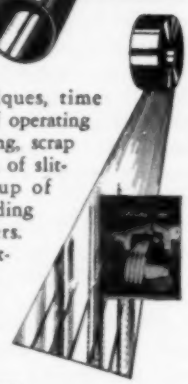
Operating techniques, time studies, analyses of operating cycles, coil handling, scrap disposal, selection of slitters and setting up of slitting lines, including coilers and recoilers. Advantages of slitting and how to compute "profit-point". 76 pages, fully illustrated.



Any or all of these books are free upon requests. Send for your copies today . . . Ask for them by title.

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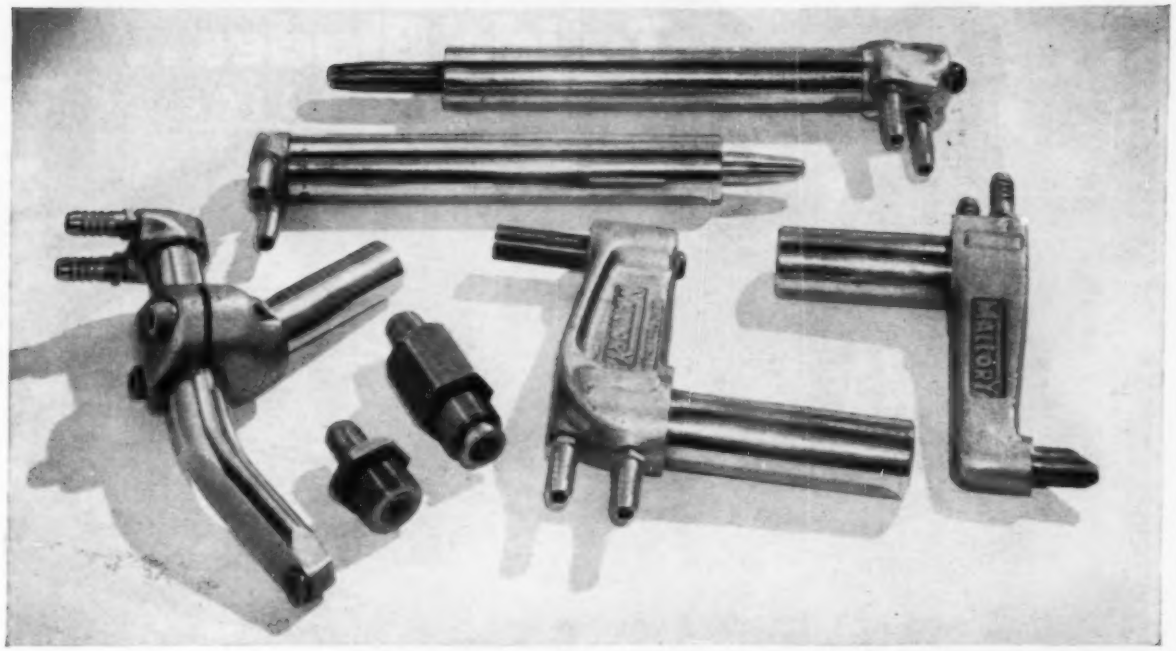
YODER COLD ROLL FORMING MACHINES



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Reduce the need for the extra cost and delivery of *special* welding holders. Mallory's new line of standard interchangeable holder components lets you choose the most desirable set-up for your requirements . . . gives you quick, economical change-over for either short or long runs.

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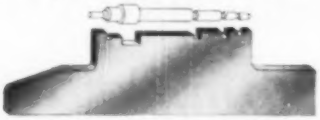
For information on titanium developments, contact Mallory-Sharon Metals Corporation, Niles, Ohio

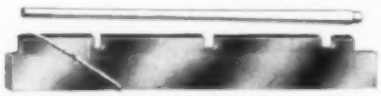
Talide® Blades . . .
THE No. 1 CHOICE OF CENTERLESS GRINDER OPERATORS!

Above view shows Landis Centerless Grinder in operation. Talide-tipped work rest blades have been supplied as initial equipment on many Landis Centerless Grinders.



LARGE ELECTRIC MOTOR PLANT

Part . . . . . Stainless Steel Rotor Shaft for Electric Motor.
Operation . . Grind 7 diameters simultaneously.
Machine . . . No. 12 Landis Centerless Grinder.
Blade . . . . . Special multiple step Talide-tipped work support blade No. C-4884.
Results . . . . Talide-tipped blade in continuous production for 91 days (2 turns per day) compared to best previous production run of 3 days with hard alloy steel blade.



LEADING ARMS PRODUCER reports outstanding service life with Talide centerless blades over past 10 years—outperforming and outlasting all other work support blades.

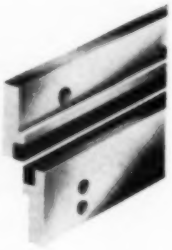
Part . . . . . 12 gauge shotgun barrel.
Operation . . Grind entire gun barrel simultaneously to series of compound angles.
Machine . . . No. 5 Cincinnati Centerless Grinder.
Blade . . . . . Special Talide-tipped work support blade 34⅛" long, having 9 steps and 10 compound angles ground to .0001" tolerance.
Results . . . . Talide-tipped blades last 150 days per grind—hardened steel blades 3 days. Several Talide blades have been in continuous production for over 5 years—being retipped with a new Talide metal wear strip every 12 to 18 months.

Over 50 sizes and styles of standard blades carried in stock—with special blades made promptly to order. Write for 76-page catalog 56-G or ask for sales engineer to call.

TALIDE ROTARY KNIVES GIVE PHENOMENAL RUN OF 90-1 . . .

A leading strip steel producer of razor blade, high-carbon, spring and stainless steel reports over 1200 coils were gang slitted with Talide knives, compared to 15 coils with steel knives. More tonnage was produced in one regrind of the Talide knives than over the entire life of a set of steel knives. Burr-free, clean-cut edges produced with scrap rate practically eliminated.

$18,000 SAVED USING TALIDE SHEAR BLADES



A large electric motor manufacturer, shearing .014" silicon steel for transformers, advises first-year savings of $18,000 in blade costs after completely equipping their press line with Talide-tipped blades in lengths ranging from 15" to 87". Talide shear blades are averaging 1,000,000 cuts per grind compared to 10,000 cuts obtained with steel blades.

METAL CARBIDES CORPORATION
Youngstown 12, Ohio

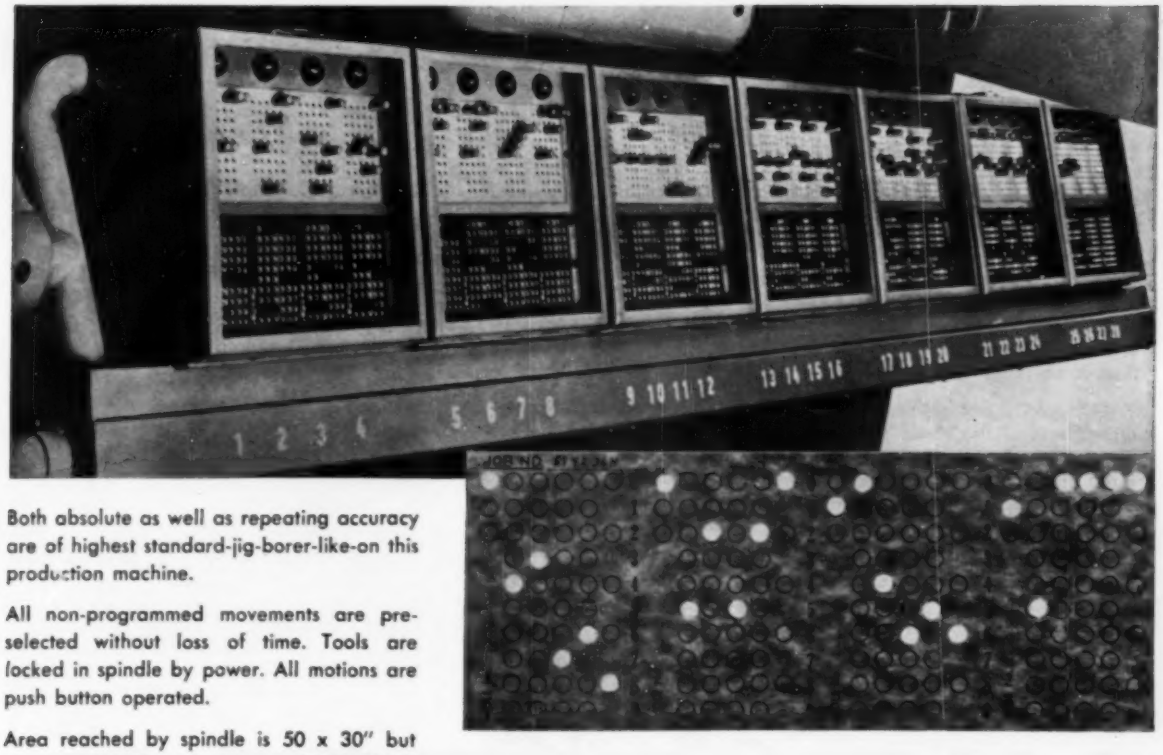
EXCLUSIVE RETIPPING SERVICE

Because of its exclusive hot press method, Metal Carbides is able to rework worn, chipped out or broken areas of carbide-tipped blades back to original size and dimension with all breaks and defects eliminated.

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Modern Die & Tool Corp. of Los Angeles, Cal. bored, milled and countersunk this stainless steel plate of 6' diameter and 9½" thickness to highest precision on the **SCHWARTZKOPFF NUMERICALLY CONTROLLED KBF2 HIGH PRECISION BORING AND MILLING MACHINE** which has numerical control built in as an integral part of the machine. This control is not an after-thought or attachment, has no complicated electronics does not require large additional investment for auxiliary equipment like computers, tape recorders, special typewriters, etc. and is easily understood by any operator who can bore a hole.

Simple punched cards inserted into the program director afford perfect recorded information control for up to 28 holes. Parts done now and later without the use of jigs will be perfectly interchangeable.



Both absolute as well as repeating accuracy are of highest standard-jig-borer-like-on this production machine.

All non-programmed movements are preselected without loss of time. Tools are locked in spindle by power. All motions are push button operated.

Area reached by spindle is 50 x 30" but pieces up to 6 feet diameter and 4 feet high can be machined. The KBF2 is a real profitable investment which has proven useful and practical in many large and small precision shops of the United States and Europe.

At right above—is shown the program director for 28 holes; also a punched card for four intersections.

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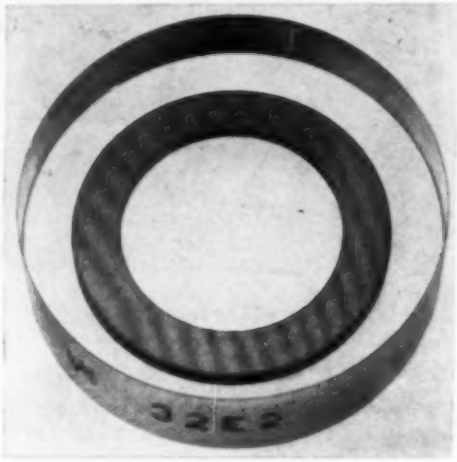
Check Seals for flatness....

....with VK LIGHT WAVE EQUIPMENTS

Van Keuren Light Wave Equipments, standard gage laboratory equipment everywhere, have long been used for checking gage blocks, toolmaker's flats, comparator anvils and other lapped surfaces in the laboratory or inspection room. In recent years, however, VK Light Wave Equipments and flats have become valuable tools on production inspection jobs. Typical is the growing use of optical flats in checking sealing rings of various materials.

The illustration at right of a sealing ring under a 3" diameter fused quartz optical flat shows how easily measurements can be made. The ring* is acceptable on sight. The bands indicate excellent surface finish (sharp definition of bands), and no warp or low edges (uniform band spacing). Flatness is within .000005" across entire ring, and .000002" across ring face (bands curve less than ½ band interval over entire ring, and 1/6 over ring face).

*Product of Sealol Corp., Providence, R. I.



VK Optical Flat and Seal Ring

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

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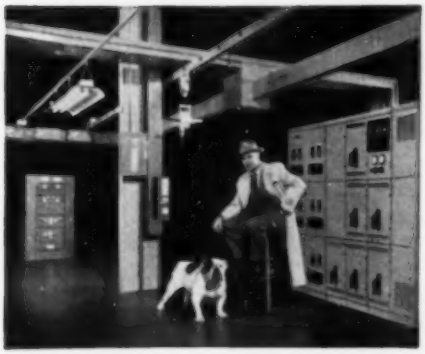
Aluminum Lo-X®—*easy to install, economical, efficient*



VERSATILE ALUMINUM Lo-X combines with BullDog Plug-in-Duct, power panels, substations, Trol-E-Duct®, switchboards, safety switches and Electri-Centers® to form a co-ordinated distribution system that delivers power when and where you need it.

Our field engineer explains how easily Lo-X BUStribution® duct installs. All Lo-X bus sections have rigid scarf-lap joints which can be connected with just a wrench and screw driver. And light aluminum bus bars put less strain on building superstructure.

Even before Aluminum Lo-X is installed you can know what the voltage drop and operating temperature of the feeder system will be. Lo-X saves space, too! It installs edgewise, flatwise, even around corners—is factory prefabricated to fit your building structure.

Look into Lo-X and its partner Plug-in-Duct®. Contact your electrical contractor or BullDog field engineer or write BullDog Electric Products Co., Detroit 32, Mich. © BDPCO

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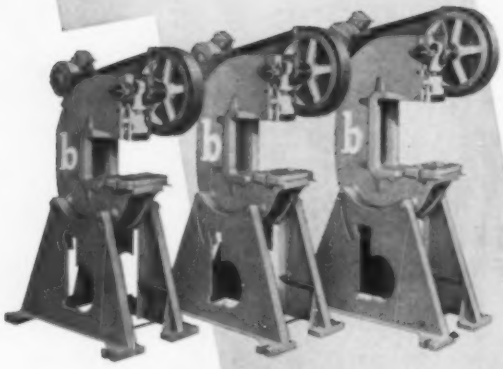
BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

HEAT BETTER ELECTRICALLY

6 NEW "PRODUCTION-BUILDERS" from benchmaster

Benchmaster, the world's largest manufacturer of small punch presses and milling machines, is constantly expanding its product line with new machines for more efficient production. Literature on the following Benchmaster equipment is available giving complete details. Write for your copies today!



NEW BENCHMASTER 10 TON DEEP THROAT PRESSES
Series 100

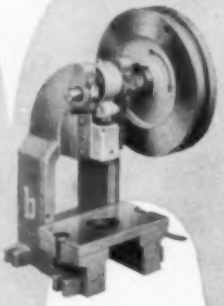
Available in 3 new models with standard strokes of 1¼". Other strokes available from 1½" to 3". Center of slide to frame 12". Shut heights are obtainable from 7" to 13" depending upon model number and stroke length desired.

OTHER BENCHMASTER MACHINES

PRESSES: Benchmasters are available in 2, 5, 8 and 10-ton capacities in the following types: Plain OBI, Deep Throat, Fixed-Bed Gap Frame, Back Geared, Half-Press and Multiple Ram.

MILLS: Benchmasters quickly convert from horizontal to vertical milling by exchanging spindle quill assemblies. Precision performance at minimum cost!

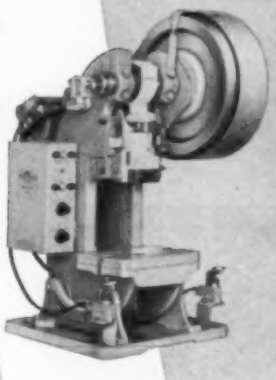
ACCESSORIES: For Presses and Mills; Roll Feeds, Cage Guards, Floor Legs, Rotary Tables, Swivel Vises, Arbors, Collets, Pedestals, etc.



BENCHMASTER 2 TON FIXED-BED GAP FRAME PRESSES

A new Benchmaster with a 4½" column spacing for feeding foil and other wide materials! For fast, efficient light manufacturing or assembly. Typical Benchmaster quality... adjustable gibs, improved sliding key-type clutch, husky frame, replaceable bronze bearings, etc.

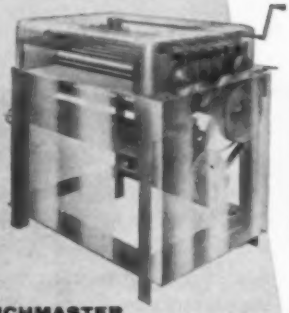
BENCHMASTER ELECTRO-MAGNETIC CLUTCH



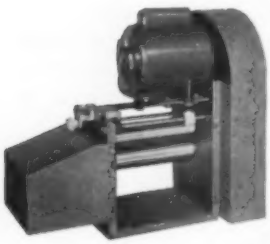
Insures instant pickup or disengagement at any portion of the stroke. Permits application to flying cut-off operations or automation of several presses from a single control source. Smooth and relatively noiseless, no sliding keys, no breakage hazards due to shock, excellent safety. Controls for manual, foot, 2-button hand, remote or automatic operation.

NEW BENCHMASTER STRAIGHTENING MACHINES

Now furnished in several series with choice of 9 or 11 rolls for handling all types of coiled stock from soft aluminum to tempered steels. Roll widths up to 36". Thicknesses up to .200". All models equipped with pinch rolls at feed or feed and discharge ends. Also available with or without magnetic clutch and brake.



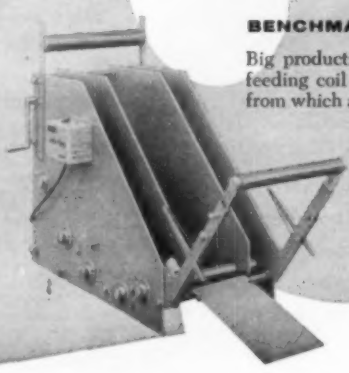
NEW BENCHMASTER AUTOMATIC MOTORIZED FEEDS



Equipped with new Benchmaster Electro-Magnetic Clutch and Brake, can be used with presses, shears, etc. Built-in electric measuring device feeds any required length before automatic shut-off. Also available with external microswitch and fixed stop for automatic shut-off. Roll widths up to 36", thickness capacity ⅛". Other specifications on special order.

BENCHMASTER KOIL-KRADLES

Big production booster for all machines feeding coil stock. Supplies a slack loop from which any machine can freely draw without pulling against the weight of a heavy coil. Equipped with Benchmaster's Variloop control which eliminates constant motor starts and stops, insures longer life. Can be supplied in Koil-Kradle Straightener Combinations.



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COPPER ALLOY BULLETIN

Reporting New Developments in Copper-Brass Alloys and Metalworking Methods

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Compared with casting or solid forging, Bridgeport cored forgings save up to 50% in materials . . . cut machining and finishing time...reduce tool costs...eliminate rejects.

Cored forgings can be held to fine tolerances with accuracies of 0.005". They have great strength, high density, uniform grain structure, no porosity, and an extremely fine-textured hardware finish. High strength parts can be forged closer to finished forms than by other methods.

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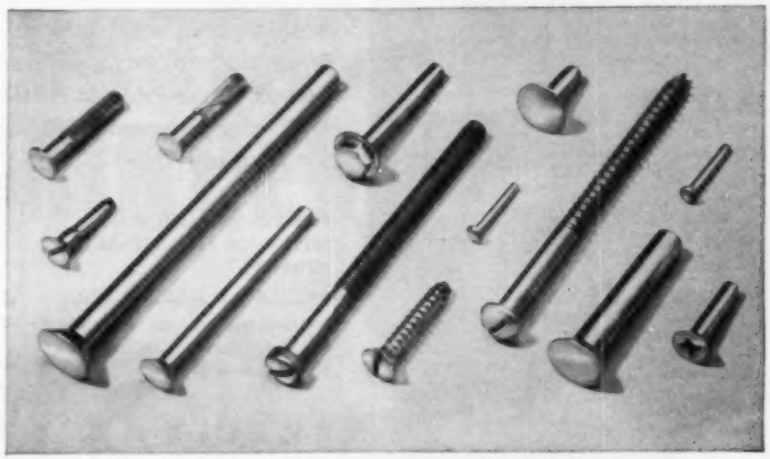
Typical cored-forged parts

Metal Laminates Solve Design, Production Problems

Bridgeport Metal Laminates provide combinations of chemical, physical and mechanical properties unobtainable in a single metal. Use them to solve dual corrosion problems, improve electrical and thermal conductivity, combine high thermal conductivity with corrosion resistance, and provide greater strength-to-weight ratios.

Write for test samples and for a copy of the 8-page booklet detailing applications, properties, types, sizes, etc., of Bridgeport Metal Laminates.

Stock Temper Bridgeport Wire Meets Many Special Cold Heading Needs



A few of the wide range of Rockford Screw Products fasteners made with Bridgeport wire.

Bridgeport's high-quality standard alloys help produce superior products and cut costs too. For example, Rockford Screw Products, Rockford, Ill., finds it possible to use our *stock temper* wire for a wide range of special and standard fasteners. Gains in economy are obvious. To conserve material and reduce manufacturing costs, the company cold heads the parts. Bridgeport Brass and Copper Alloy wires have the high qualities of malleability, ductility, strength and stiffness for this process.

Alloys Used

Three Bridgeport Alloys are used by Rockford Screw Products:

70-30 Brass 69: an extremely ductile wire, particularly suitable for making exceptionally large heads and certain types of hollow rivets.

Silicon Bronze 609: an outstandingly malleable alloy even in hard-drawn condition. Finished bolts above 100,000 lb per square inch can be produced from it. This alloy is highly resistant to stress-corrosion cracking and is suitable for outdoor construction where brass and steel may not be satisfactory.

Commercial Bronze 25: although named "commercial bronze," this alloy does not contain tin. It resists season-cracking and is more resistant to dezincification than brass. It is recommended for interior or exterior applications.

Bridgeport's Wide Range of Alloys

Rockford Screw Products has found that corrosion resistance, lasting strength and hardness, and ease of finishing make Bridgeport Brass and Copper Alloys ideal for all types of industrial fasteners. And the great variety of alloys available assures the selection of a metal with exactly the right characteristics for any particular job.

Whatever the application and whatever the industry, Bridgeport Alloys help improve products, smooth production, cut costs. Your Bridgeport Salesman will be happy to advise you—and through him is available the full experience and facilities of Bridgeport's Technical Service. Call him.

BRIDGEPORT BRASS

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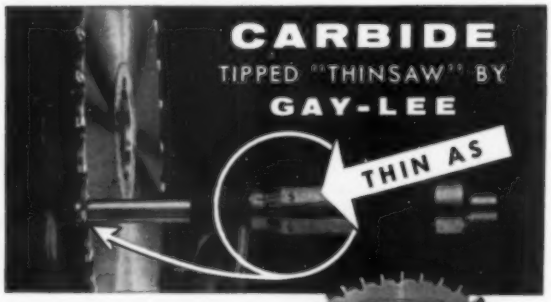

Ideal for precision, high-production sawing, slitting, slotting! Exclusive Gay-Lee design features long-wearing carbide tips brazed into a circular seat which provides more brazing area, greater mechanical strength and maximum tip security. (Patented, U. S. Pat. No. 2675603, manufactured under license.)

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- Wafer-thin for the most delicate work
- Maintain positive alignment and rigidity
- Cut to full depth without runout
- Available in any carbide grade
- O. D. from 1½" to 10"
- Made to any tooth form

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Write for list of Special Reports currently available from

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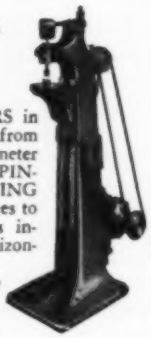

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

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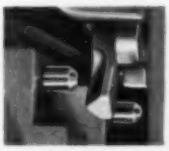
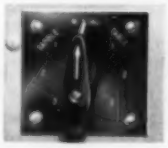
and now . . . Abrasive "operator engineering" brings you —

AUTOMATIC CYCLING ON SURFACE GRINDERS

Grind precision work to size — *automatically* — like this: Simply set this down-feed increment from .0001″ to .0025″. Then, the head automatically down-feeds that amount each time these adjustable trips  reverse the saddle, or if you wish, each time this table control reverses the table. When this micrometer stop, which you have set to finish size, contacts this micro switch, the down-feed knocks off and this red light flashes on. Then, depending upon how you have set this control,  the grinder will automatically spark out 1, 2 or 3 times. Abrasive's cost-cutting automatic cycling is available on all Hydrabrasive precision surface grinders which are illustrated and described in this colorful brochure. *Write for it, now!*

ABRASIVE MACHINE TOOL COMPANY

East Providence, Rhode Island.

WORLD'S FINEST DC WELDERS

miller

MODEL
SRH

Only 30¼" high, the new Gold Star SRH combines compactness with the sensational improvements introduced by the Miller Gold Star line. These include wholly new transformers, completely sealed semimetallic rectifiers and weld stabilized circuits. Where stacking or paralleling adaptability plus the finest dc performance ever achieved is indicated, the Gold Star SRH is the unequaled answer. Available in three models with 60% duty cycle ratings of 200, 300 and 400 amperes.

MODEL
SR

GOLD STAR DC-SR

The best welding current **ever** produced is delivered here. You **get** maximum arc stability for sounder, denser welds with **all** electrodes in **all** positions. And you get more of them in less time! This revolutionary performance coming from a machine of record-breaking dependability (see January welding magazines), has led industry and individuals to say of the Miller Gold Star SR-DC: "The SR gives **perfect** dc welding current; Easiest arc starting — bar none; Smoothest arc I ever used, and quiet to boot."

Available in both duplex and single models with ampere range from 200 to 1200. Complete complement of control equipment gives the Gold Star SR unlimited flexibility, plus milestone performance and unmatched dependability.

miller ELECTRIC MANUFACTURING COMPANY, INC., APPLETON, WISCONSIN

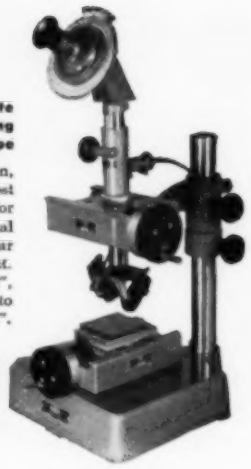
EXPORT OFFICE: 250 East 57th St., New York 19, N.Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

From the *American Machinist* Library of *tips for Top Shop Men*

UILD a good reputation in your community. Morale and efficiency usually are high in the plant that is known as "a good place to work."

Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".



Cut rejects, speed production

Fast, reliable readings to 0.0001" with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.

Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Filar Micrometer Microscope

High quality, low cost instrument for extremely precise measurements. Range 0.08", reading to 0.00002".

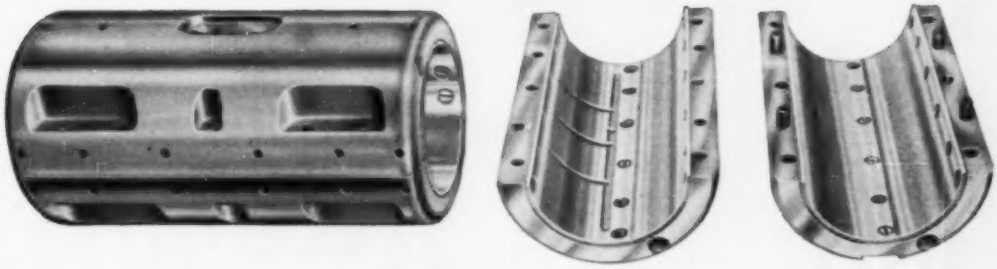
Write for Bulletin 161-54 showing applications, models, specifications.

The Gaertner Scientific Corporation

1259 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

Novel Design provides *Astonishing Bearing Life*

The life of the HILL front spindle bearing on HILL horizontal spindle hydraulic surface grinders is truly astonishing. This bearing has been an *exclusive* HILL feature for more than 15 years. The necessity of replacement, under constant use, is practically unknown.



The front spindle bearing on HILL horizontal spindle hydraulic surface grinders was engineered by the HILL ACME COMPANY and has proven in the field to operate indefinitely. An alloy bronze bushing is fastened to a semi-steel casting with brass screws. The bronze bushing is undercut lengthwise in four equidistant locations on the outside diameter to allow for spindle expansion. (Darker areas in photo show undercut sections.) A perfect bearing surface is established in the I.D. of the bronze directly opposite the undercut sections. Oil is forced into specially designed concave relief areas which act as oil wedges assuring long bearing life. Hardened dowel pins guide the two halves together to their original position. The bottom half of the bearing has an oil return slot shown at the edge of the half section on the outside diameter. Note that there are NO oil grooves in this bottom half or in the quarter half of the top section. The shaft rotation spreads the oil film from the oil distribution grooves to the perfect bearing surfaces. Any additional oil grooves would act as scrapers and be detrimental to the oil film formed around the spindle.

This is just one of the many exclusive construction features that result in the longer life and permanent accuracy of HILL heavy duty surface grinders. Detailed literature on these high-precision machine tools is now available.

24" x 24" x 72" HILL horizontal spindle surface grinder grinding blanking dies to extremely close tolerances. Also built in Vertical Spindle design.

THE HILL ACME COMPANY

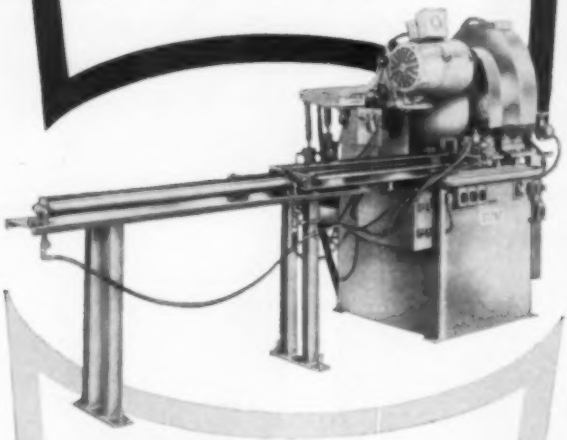
HILL DIVISION . . . . . ESTABLISHED 1882

1201 West 65th Street • Cleveland 2, Ohio

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

CUT ANY METAL

Even Hardened Tool Steel in 2 to 4 seconds per square inch!



STONE

MODEL M-100
Automatic, Chop-Stroke, Cut-Off Machine

The M-100 and M-150 are designed and engineered for production-run cutting of soft to super-hard materials — swiftly, and with a mill-like finish that often eliminates surfacing operations. Extremely close tolerances are maintained day-in, day-out, on ferrous and non-ferrous bar, pipe, tubing, structurals, forms and extrusions.

Dry cutting of ferrous materials is done with an abrasive wheel without changing characteristics of the metal cut. Non-ferrous metals are cut with a steel saw blade and cooled by an oil mist spray.

M-100 FEATURES ASSURE SPEED, ACCURACY

ELECTRO-PNEUMATIC BAR FEED—Automatically feeds precise lengths of stock to preset stop. Travelling vise eliminates slippage and scratching common with ordinary feed-fingers. (Two air actuated vises hold the material on each side of the blade during the cutting cycle.)

STONE PATENTED AUTOMATIC WHEEL WEAR COMPENSATOR—For use with abrasive wheels. Automatically adjusts cutting stroke to compensate for wheel wear. Maintains fast, accurate cutting without shutdown for adjustment.

AUTOMATIC POWER STROKE CUTTING HEAD—Exclusive geared-in-head 10 or 15 H.P. motor delivers maximum power to cutting edge. Head is equipped with Power Stroke with flow control valve located in front of the machine for convenient adjustment of power stroke with ammeter, that enables operator to perform entire cutting cycle with one simple control. Saves to 25% on wheel costs.

HYDRAULIC WHEEL FEED CHECK CYLINDER—Advances wheel to cutting position rapidly—then slows wheel feed to pre-set, controlled feed of cut.

WRITE TODAY for complete information on the M-100 and other cut-off machines by STONE. 15 Models available in 3½ to 20 H.P., manual, semi- or fully automatic operation. Call your nearest dealer.

". . . represented in every major industry throughout the world"

STONE MACHINERY COMPANY, INC.
151 Fayette Street, Manlius, New York

IT'S PLAIN TO see

A Boring Head That Won't Face is NOT Complete

NOW you can get a boring head that will BORE, FACE, TURN and GROOVE at no more cost than you would pay for a plain, single purpose boring head.

LOOK INTO THIS before you buy that new head. Write for full details.

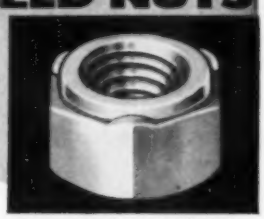
CHANDLER TOOL CO.
Muncie, Indiana, U.S.A.

Chandler-Duplex

COMBINED BORING AND FACING TOOLHEADS

These 2 WELD NUTS

for blind assemblies

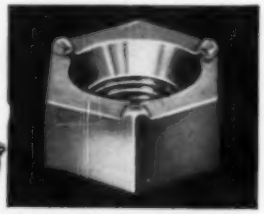


will give you

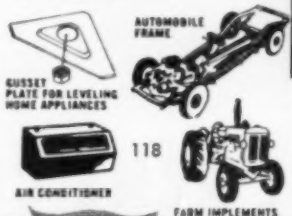
- **Easier Positioning**
- **Quicker Fastening**
- **Extra Threaded Depth at**
- **Less Cost**

Available with or without Gripco locking feature. Three weld projections on bottom of nut provide a firm non-rocking electrical connection during welding. Write for samples and full details today.

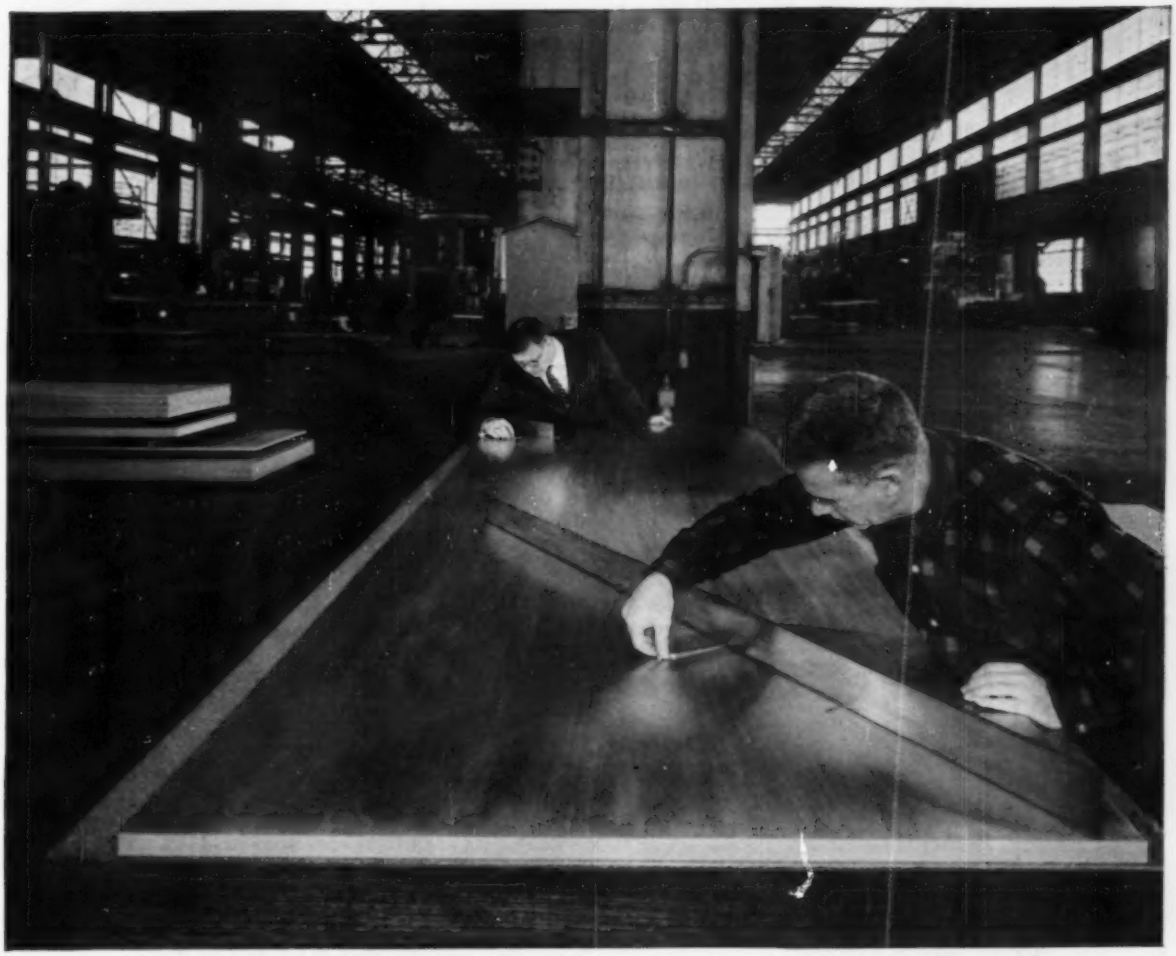
Gripco Pilot-Projection Weld Nut, circular pilot designed, provides quick, easy positioning of nut in bolt hole for instant resistant welding. No jigs, no fumbling, no waste of time. Weld spatter can not foul threads. Two heights for different metal gauges.



Gripco Countersunk Weld Nut eliminates time-wasting retapping of nuts after welding. Exclusive countersunk nut bottom eliminates fouling of threads by weld spatter. No time wasting false starts, no cleaning of damaged threads, nut ready to receive bolt immediately.



GRIP NUT COMPANY
102 Broad St. • South Whitley, Ind.



HERE'S REAL FLATNESS! *Dow magnesium tooling plate flatness is measured as the maximum deviation under a straightedge.*

NEW! CLOSER FLATNESS TOLERANCES IN DOW MAGNESIUM TOOLING PLATE

PRECISION PLUS. Now you can buy this lightweight tooling metal with closer flatness tolerances than ever before. With new production methods Dow magnesium tooling plate is now manufactured to these tolerances:

	In any one foot		In any 6 feet	
THICKNESS	GUARANTEED	TYPICAL	GUARANTEED	TYPICAL
0.250"-1.000"	0.005	0.003	0.015	0.007
1.001"-6.000"	0.010	0.005	0.020	0.010

COSTS NO MORE. This big improvement in quality and value costs you not one penny more! Dow magnesium tooling plate STILL costs less than other lightweight tooling metals. You save money twice—once when you buy it and again when you use it.

Magnesium tooling plate is low in cost because it is rolled (not machined) to a flatness satisfactory for virtually all tooling purposes.

Next time you need a tooling metal, get in touch with one of the Dow magnesium suppliers listed below. A trial will convince you it pays to switch to magnesium. THE DOW CHEMICAL COMPANY, Magnesium Sales Department, Midland, Michigan, MA 1430C.

AVAILABLE FROM STOCK AT:

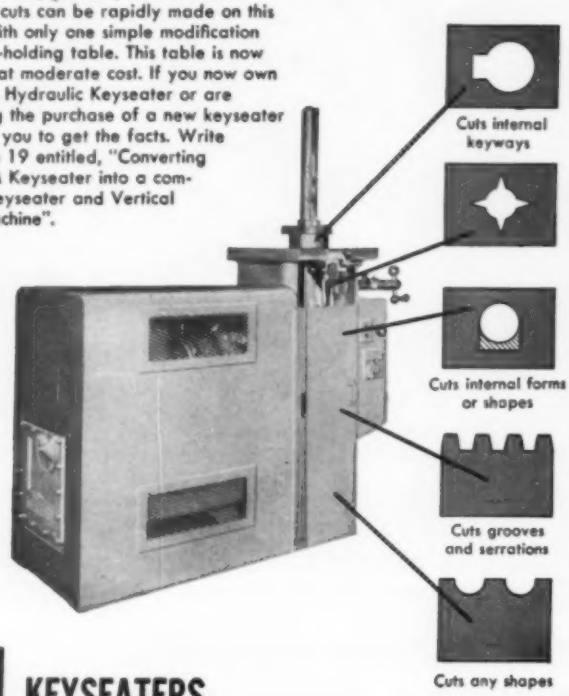
COPPER AND BRASS SALES, Detroit 12, Michigan
FULLERTON STEEL AND WIRE CO., Chicago, Illinois
HUBBELL METALS INC., St. Louis 3, Missouri
A. R. PURDY CO., INC., Lyndhurst, New Jersey
RELIANCE MAGNESIUM COMPANY, Los Angeles, California
VINSON STEEL AND ALUMINUM COMPANY, Dallas, Texas

YOU CAN DEPEND ON DOW

TRIPLE THE USEFULNESS OF YOUR M&M KEYSEATER AND VERTICAL CUTTING MACHINE

Simple modification greatly increases productive capacity of this versatile machine.

An M & M Hydraulic Keyseater is not only a keyseater that cuts internal keyways up to 5" wide but a vertical cutting machine as well. Serrations, grooves, teeth—a wide variety of cuts can be rapidly made on this machine with only one simple modification — a work-holding table. This table is now available at moderate cost. If you now own an M & M Hydraulic Keyseater or are considering the purchase of a new keyseater it will pay you to get the facts. Write for Bulletin 19 entitled, "Converting the M & M Keyseater into a combination Keyseater and Vertical Cutting Machine".



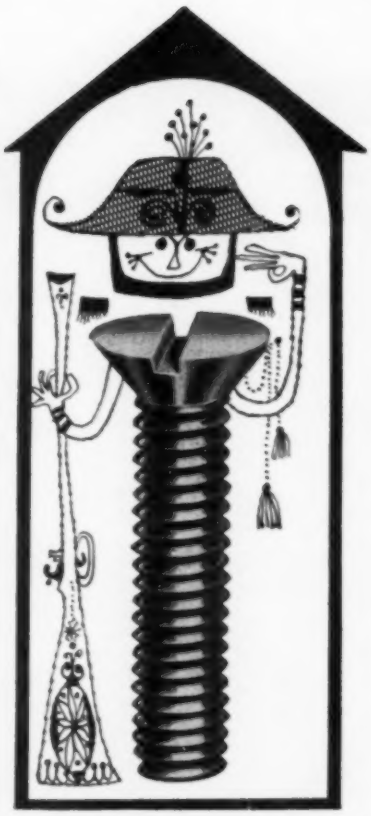
M&M KEYSEATERS AND VERTICAL CUTTING MACHINES

98

MITTS & MERRILL • 104 Holden Street • SAGINAW, MICHIGAN

NO GUIDED MISSILES . . .

but everything you need in used or rebuilt machine tools can be found in our SEARCHLIGHT SECTION See "Index to Advertisers" for location of section.



GUARD AGAINST CORROSION WITH ALCOA ALUMINUM FASTENERS

Whatever you make, make it better of aluminum and fasten it with Alcoa® Aluminum Fasteners. Guard against both galvanic and atmospheric corrosion and get lasting sales appeal with bright, carefree aluminum fasteners. For your requirements, call your nearest Alcoa sales office. Complete stocks of all standard types and sizes of Alcoa Aluminum Fasteners are on hand at your local Alcoa distributor. Look in the Yellow Pages of your telephone directory.

ALCOA ALUMINUM FASTENERS

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Exciting Adventure
Alternate
Monday Evenings.

Your Guide to the Best in Aluminum Value

FREE FACTS SAMPLES FREE FACTS

Aluminum Company of America
2238-F Alcoa Bldg., Pittsburgh 9, Pa.

Gentlemen: Please send complete specification data and samples of Alcoa Aluminum Fasteners.

Name_____

Title_____

Company_____

Address_____

THE SOLUTION TO YOUR

"JOINT TROUBLE"

IS U. S. DRILL HEADS!

This is no "medicine man" talk! U. S. Universal Joint Heads have greater reserve stamina than you'll ever need! Heavy-duty joints are specially heat treated for greater capacity than rated . . . drivers and spindles have more than ample bearing . . . shaved gears insure smooth, quiet, full-power performance.

Get profit-making universal joint adjustability with U S. Drill Heads. Less downtime, quicker changeover, positive hole positioning. And, for long production runs, Slip Spindle Plates provide the advantages of fixed center heads.

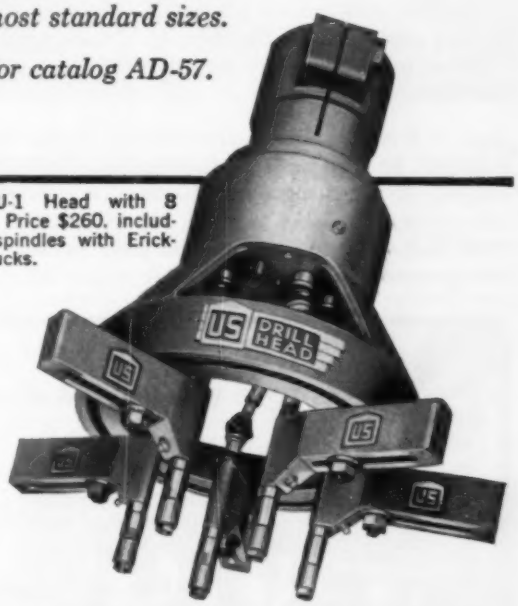
Immediate delivery on most standard sizes.

Write for catalog AD-57.

Only U. S. Drill Head provides a FULL RANGE of standard Universal Joint Adjustable Heads

Style Head	No. of Drivers	Drilling Capacity	Drilling Area (Dia.)
U-1	8	¼"	6"
U-1L	8	¼"	8"
U-1½	6	½" or ¾"	6"
U-2	10 or 12	½" ¾"	10" 9¾"
U-3	10 or 12	15/32" to ⅞"	12"
U-4	12	15/32" to 1-1/16"	15"

Style U-1 Head with 8 drivers. Price $260. including 2 spindles with Erickson chucks.



US DRILL HEAD

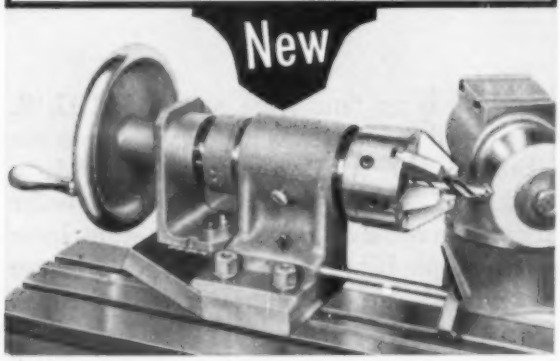
Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.

UNITED STATES DRILL HEAD CO.

BURNS STREET • CINCINNATI 4, OHIO

TRU-KUT POINT MASTER

Produces & Reproduces "Tru-Kut" Points On Drills . . . Easier, Faster And At Much Lower Cost



Now! After quick and easy set-up on Point Master, you can grind Tru-Kut drill points having any required cutting or relief angle. Also, from original set-up, duplicate drill points can be produced again and again. The Tru-Kut Point Master is comparatively low in cost and assures faster drill sharpening.

The Tru-Kut Point Master can be used on most cutter grinders, universal grinders and surface grinders. Standard grinding wheels are used. The front edge of wheel periphery is dressed to a radius that provides the self-centering "Tru-Kut" point.

Types of drills you can resharpen with the Tru-Kut Point Master for more efficient drilling are almost unlimited. You can also grind; lead angles and chamfers with radial clearance on taps; chamfers, end cuts and chip-breakers on 2-flute and 4-flute tools; chamfers and points on step-drills; thin-out webs at front; and gash cutting edges.

TRU-KUT Drill Points Assure:

- Rounder Holes
- Straighter Holes
- Truer sized Holes
- Practically burr-free Holes
- Less Bell-mouthing
- Self-centering drills
- Longer drill life
- Cooler cutting drills
- Cutting edges from O.D. to center of drill point
- Proper clearance on entire cutting edge of point

DETROIT REAMER & TOOL CO.
780 WEST MAPLE ROAD
P.O. BOX 174 • BIRMINGHAM, MICHIGAN

THIS VAST IMPROVEMENT OVER CONVENTIONAL HEIGHT GAGES OFFERS A NEW CONCEPT IN THE MAKING OF ACCURATE MEASUREMENTS

The radically **NEW OPTIC VERNIER HEIGHT GAGE** **TUMICO**

Saves Time and Labor!

RAPID QUICK ADJUSTMENT
Scriber clamp permits firm clamping above and below jaw

SIZES AVAILABLE
18" 24" 36" 48"
60" 72" 84"

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UPRIGHT COLUMN **H** BEAM DESIGN for SUPERIOR STRENGTH and RIGIDITY PREVENTING SWAY and VIBRATION

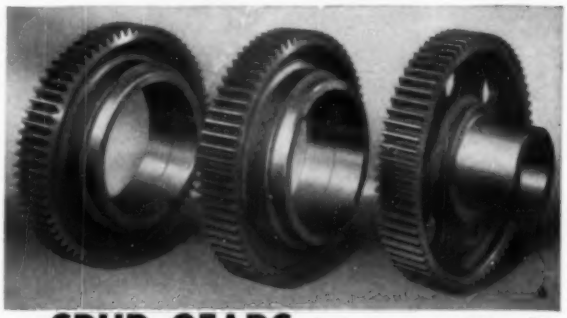
READING ACCURATELY with NAKED EYE from SCALE and VERNIER from REAR of GAGE

EASY READING 2-1/2" LONG VERNIER
Solves problems of reading fractions of 1/1000" quickly and accurately

FINE ADJUSTMENT thru screw on base
ADDITIONAL FINE ADJUSTMENT ON TOP OF BEAM ON LARGER BASES

LARGE SOLID BASE

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 AM LAFAYETTE STREET • NEW YORK 12, N.Y.

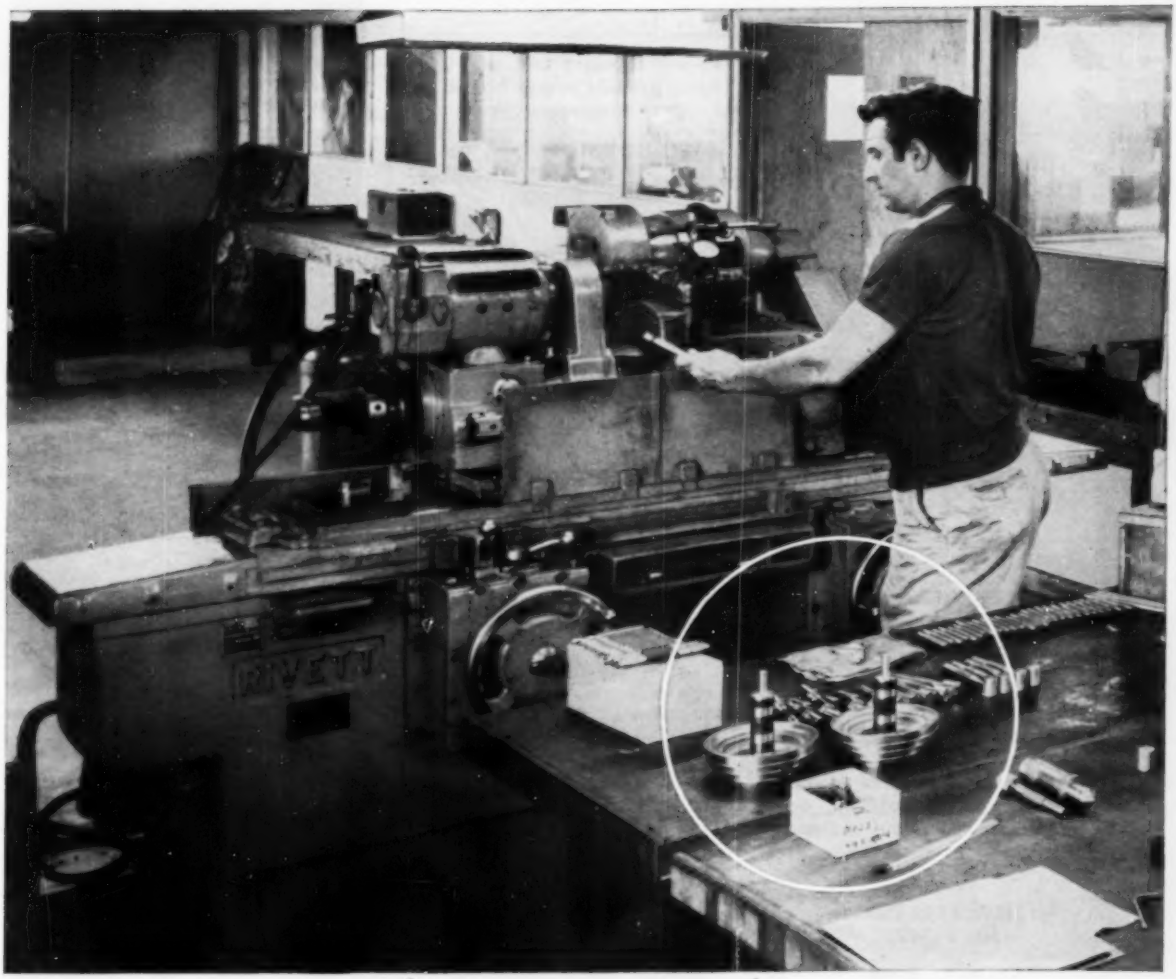


SPUR GEARS for Every Need!

This trio is representative of Stahl's tradition of precision-in-quantity. These steel spur gears have identical specifications—72 T., 2" C.P., and 6" F. Two are fitted with bronze bushings. A 45" Universal Slabbing Mill is their destination. General-purpose or highly specialized, Stahl makes them all, EXACTLY to specification, promptly and economically. Get our estimate.

SPURS TO 72" PD. 1 DP
BEVELS TO 54" PD. 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD. 2 DP
CONTINUOUS TOOTH HERRINGBONE TO 60" PD. 2 DP
SPROCKETS TO 72" PD. 2½" CP
RACKS TO 20' FT. LONG. 3 DP
SILENT GEARS: RAWHIDE, BAKELITE, FIBROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS— OF CARBON OR ALLOY STEEL

Stahl
GEAR & MACHINE COMPANY
3901 HAMILTON AVENUE
CLEVELAND 14, OHIO



Would your grinders have met these tolerances?

One ten-thousandths on diameter; 50 millionths total runout; 2 to 3 R. M. S. finish . . . tolerances that Peninsula Tool Co., San Carlos, Calif., *had* to hold on production runs for a well known manufacturer of ultra-sensitive tape recorders! After every grinding company on the West Coast had failed, Peninsula did it . . . because, as Peninsula Tool states, the job was put on *Rivett 1024 Grinders!*

Rivett 1024 Internal and Universal Grinder

You can keep this grinder always busy! Do any number of internal jobs and then switch over to external work. It has all the features of a true internal grinder—extra-long table moves sufficiently to left to permit plug gauging to 6" depth without retracting wheelhead slide. Both spindles are flange mounted in massive wheelhead which swivels full 180° for quick conversion! Grinds any hole to 9" dia., externally to 12" dia.

Send for catalog 1024B and learn how this famous grinder does toolroom quality on a production basis . . . switches quickly from internal to external . . . really saving time and cutting costs!

RIVETT LATHE & GRINDER, INC.
Dept. AM-6, Brighton 35, Boston, Massachusetts

RIVETT
INTERNAL & UNIVERSAL GRINDERS

Recent changes and additions provide many bonus features.

Unobstructed perimeter (work from any side!)

Six Wheel Models

Capacities to 5,000 pounds.

LIFT LOWER TRANSPORT with PORTELVATOR

The Handy HAMILTON Portable, Elevating Table

3 table surfaces 4 point support

Four Wheel Models

Special Designs too!

More Service for Less Money than Any other unit of equipment

A portable, height adjustable, steel table-truck-work bench! Used for die transfer, machine feeding, assembly (at *best* height, in *best* light). For lifting, lowering, transport of all compact, heavy loads. Saves "handling" accidents to both men and materials. Saves minutes for men wherever used.

Write* for NEW, FREE Bulletin No. P-2408

* ADDRESS

IT'S A Hamilton Tool — USE IT WITH CONFIDENCE — 2408

THE HAMILTON TOOL COMPANY
830 South Ninth Street
HAMILTON, OHIO

REPRESENTED IN CANADA BY
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Sykes Tool Corporation, Ltd., 4950 Queen Mary Road, Montreal.

there's a place in your shop for

LINLEY

JIG BORING MACHINES

Designed specifically for small precision jig boring. Accurate to a high degree—simplified design enables fast, precise set up and operation. An extremely versatile machine that can save you money by releasing larger capacity jig borers for heavier work. Write for complete information on these improved Linley Jig Borers. Table size: 7" x 17½"; table travel: 6½" x 10".

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PRINTED CIRCUIT MASTERS
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With FastLine "Do it yourself" coated plastic you can produce transparent layouts with accurate, easy to read lines—professional layouts for chart-gages, sight-gages and many other purposes. What's more, you can make them right in your shop—on the job—as you need them—when you need them. After scribing is completed, FastLine chart-gages are ready for use in minutes.

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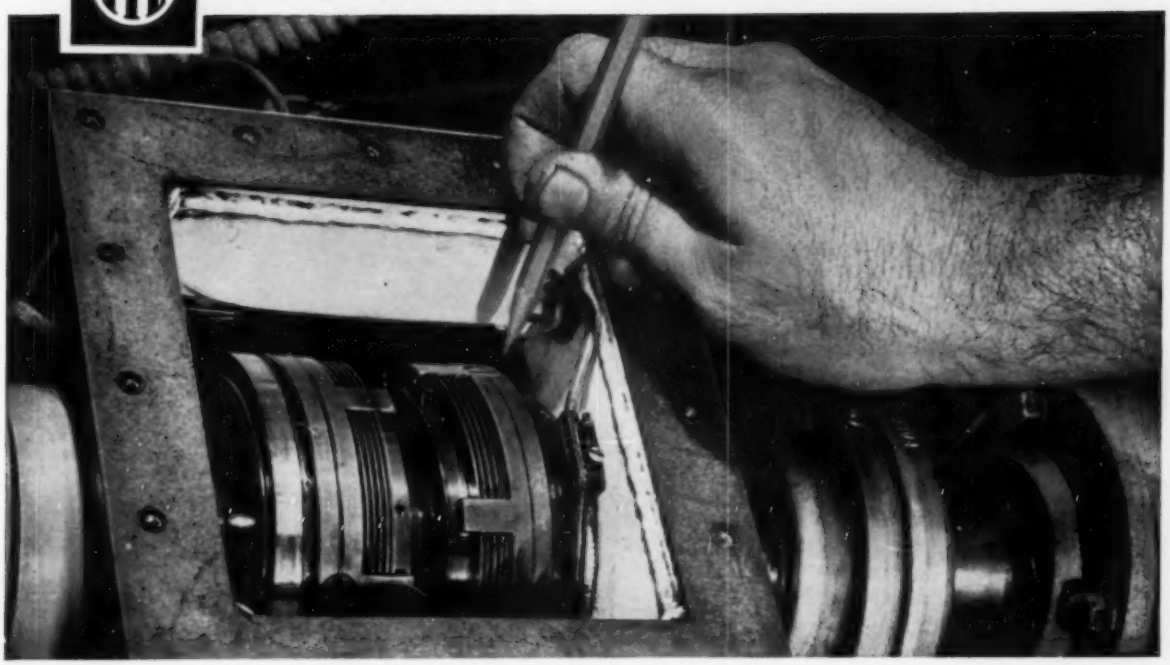
ELECTRO-CLUTCHES



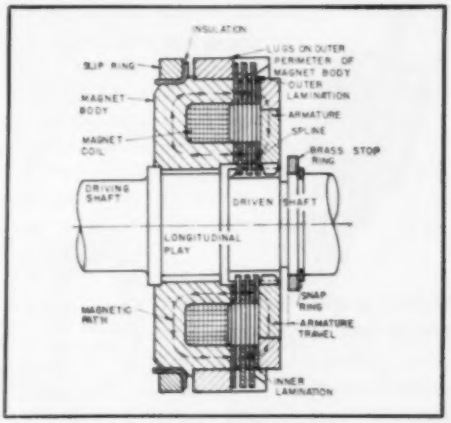
NO ADJUSTING

Get instant speed and feed changes for your machines without need for periodic checking and adjusting of clutches or gradual loss of torque. This is how: insist on genuine I-T-E Electro-Clutches.

No air gap. The patented closed magnetic circuit passing directly through the laminations provides tremendous torque in small space without need for maintaining precision air gaps. So the I-T-E Electro-Clutch goes right on giving uniform, troublefree clutching year in and year out.

More for your money. I-T-E Electro-Clutches are designed to operate in an oil bath. They can go right into your transmission box—often without altering dimensions. All-steel laminations outlast other clutch metals, plastics and friction discs—thus insuring longer clutch life. Safe 24 v operation permits use of telephone type relays, proved for dependability.

Select the exact clutch type you need from a wide range of stock models. For complete information, write I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Sts., Philadelphia 30, Pa.



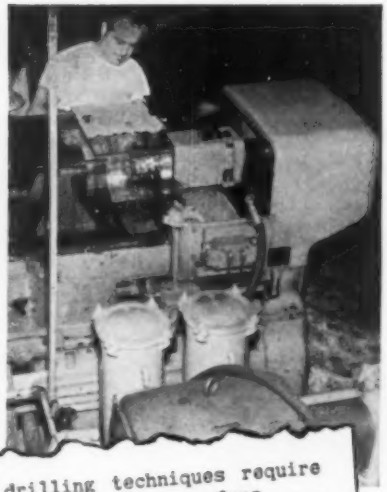
Principle of operation. Alternate laminations key with perimeter lugs and splined shaft respectively. Rotate freely until magnet coil is energized. Magnetic flux attracts the armature, compressing the laminations with great force, engaging clutch.

I-T-E Electro-Clutches are already in use by these leading companies:

Bullard Fosdick Sundstrand
Giddings & Lewis

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

GUN DRILLING? This testimony speaks for itself:

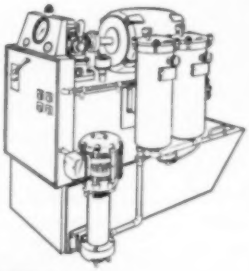


"Modern gun drilling techniques require precision-engineered fluid transfers . . . and an absolutely clean supply of coolant delivered at high pressures and controlled temperatures. The Sealol equipment in our plant has performed with complete reliability . . . on long production runs."

C. S. Einsiedler, Vice President in Charge of Production, Standard Die Set Co., division of Harsco Corp.

Sealol's DRILL ADAPTOR and COOLANT SUPPLY UNIT permit CLOSE TOLERANCE finished HOLES in one HIGH-SPEED pass!

SEALOL FLUID TRANSFER — feeds coolants from stationary source to rotating gun drill . . . at speeds to 10,000 RPM, pressures to 1000 PSI . . . directly to cutting edge of drill keeping work cool, flushing chips out continuously.



SEALOL HI-PRESSURE COOLANT SUPPLY UNIT — for all types of precision drilling . . . filters, cools, pumps coolants at pressures to 1,000 PSI . . . to 40 GPM (higher capacity units available).

SEALOL

SEALOL CORP
206 Post Road, Providence 5, R. I.

☐ Please send Bulletin describing Sealol Drill Adaptor and Coolant Supply Unit.

☐ Please send Informative Booklet, "An Introduction to Gun Drilling."

Name ..... *Title* .....

Company .....

Address .....

City ..... *Zone* ..... *State* .....

NEW by AIRETOOL . . . Heavy Duty, Small Wheel Pneumatic GRINDER

Grinding and finishing of dies, patterns, castings or any metal parts can be done quickly and efficiently with this new Airetool pneumatic grinder. It's lightweight and compact for easy maneuvering around intricate construction. Powerful Airetool 3-blade ball bearing motor operates smoothly with constant power. Optional lever or button throttle. Precision ground, hardened metal parts assure long life.

SPECIFICATIONS • MODEL 400G
Speed: 19,000 rpm
Size: 1½" dia. x 6½" long
Weight: 1½ lbs.
Capacity: ¼" collet chuck or ⅜" — 24 spindle
Operating Pressure: 90-100 psi

Write for complete catalog on the Airetool line of portable pneumatic equipment for increased production and lower operating costs.

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

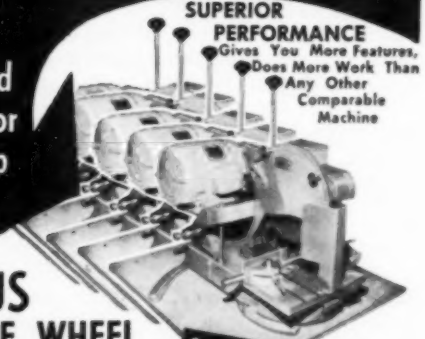
CANADIAN PLANT: Brantford, Ontario
EUROPEAN PLANT: Vlaardingen, The Netherlands

Airetool offices and representatives in principal cities of U.S.A., Canada, Mexico, Puerto Rico, South America, Hawaii, England, Italy, Europe, Japan.

LOW COST

priced so low you can afford several for your shop

SUPERIOR PERFORMANCE
Gives You More Features, Does More Work Than Any Other Comparable Machine



The NEW BACKUS ABRASIVE WHEEL CUT OFF SAW For Ferrous Metals

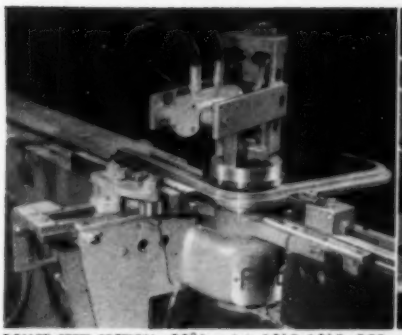
HERE'S WHAT THIS SENSATIONAL MACHINE CAN DO IN YOUR SHOP . . .

- Cuts 1⅛" bars, 2" tubing, 1½" pipe, 2" x 2" x ¼" angles
- Protects for overload and low voltage
- Has Quick action vise
- PLUS special engineered leverage for maximum sensitive "feel"
- Eliminates costly breakdowns
- Prevents high maintenance

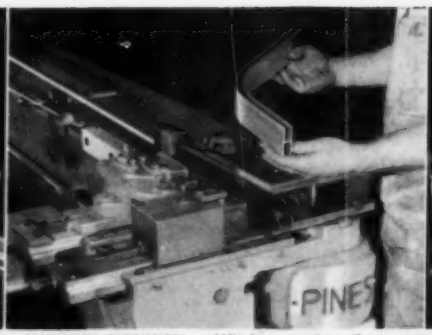
Converts Easily For Cutting of Non-Ferrous Materials Also! This abrasive saw is already machined to accommodate the Backus Multi-Purpose Saw Unit. With this conversion unit, the saw may be used for cutting both ferrous and non-ferrous metals!

Also Available . . . BACKUS NON-FERROUS CUT OFF SAW For Aluminum and Aluminum Extrusions, Plastics, Brass, Slats and Roll-Up Awnings

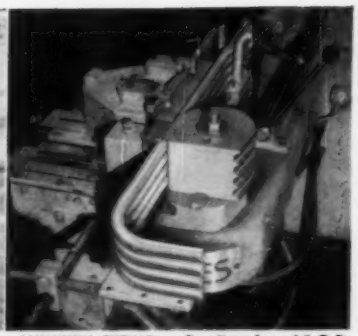
BACKUS SINCE 1914 machine works
532 ROUTE 17 CARLSTADT, NEW JERSEY



ROLLED-STEEL SECTION—90° bends in 1¾"x1¾"x.059 stock produce automobile seat frames. Split dies with automatic actuator make possible speeds up to 500 bends per hour.



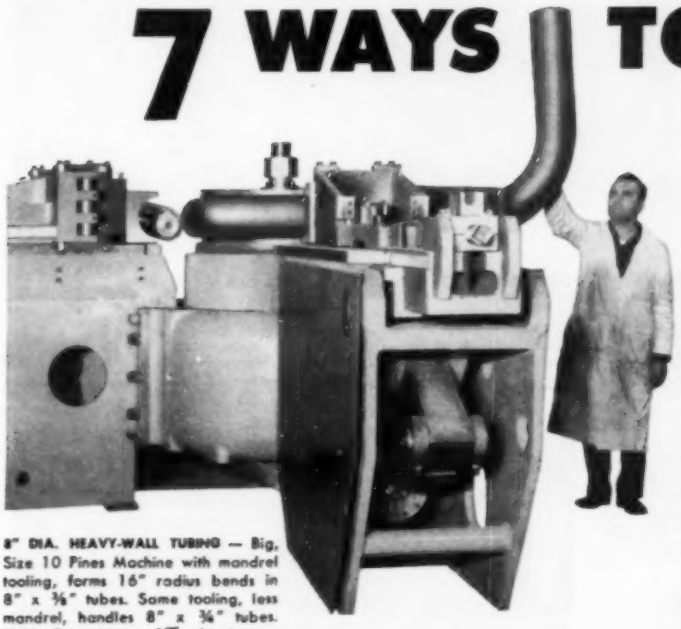
ALUMINUM EXTRUSION — Window awning ribs are accurately formed on a 5¾" inside radius using leaf-spring mandrels. Split-die tooling speeds loading and unloading operations.



ALUMINUM TUBING — Bending four 1" O.D. x .035 workpieces simultaneously on a 3½" CLR produces up to 1200 pieces per hour for large furniture plant.

7 WAYS TO CUT COST

Production Bending . . . the "PINES-WAY"



8" DIA. HEAVY-WALL TUBING — Big, Size 10 Pines Machine with mandrel tooling, forms 16" radius bends in 8" x ⅜" tubes. Same tooling, less mandrel, handles 8" x ¾" tubes. Holds flattening to 8%, thinning on outside to 10%.

Hundreds of metalworking plants have found it possible to effect substantial savings by applying Pines Machines in fabricating a wide range of tubing, pipe, extruded or rolled-shaped parts. As illustrated, they are profitably used today on large or small work, and on both short as well as long run jobs. Production-wise and cost-wise, you will find bending the "Pines-Way" is a fast, accurate metal forming method. For assistance with any job or a cost analysis, call on Pines Engineers without obligation.

Write **FOR FREE DATA SHEETS**

For additional cost cutting ideas write for free copies of "Pines News" — illustrates latest bending techniques applied to actual jobs.

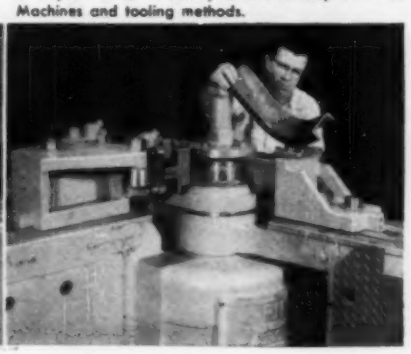
PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery | 672 WALNUT • AURORA, ILLINOIS

AIRFOIL SHAPE—1⅜" x 2⅛" aluminum aircraft struts are now rapidly formed at production speeds. Segmented mandrel and wiper die insure smooth, accurate 90° bends on 4¼" CLR.

HEAT EXCHANGER COILS — This tooling set-up produces accurate 180° serpentine bends in 2" O.D. x .065 tubing on 2½" CLR. Operating speed is 150 bends per hour.

STEEL CHANNELS — Bending heavy 4" x 5.40# steel channels on a 3½" I.R. for truck frames is another example of the versatility and efficiency of Pines Machines and tooling methods.



WILLIAMS-WHITE HYDRAULIC GAP FRAME PRESSES

- Sensitive and positive control of bending ram
- Self-contained hydraulic pumping unit and motor
- Adjustable stroke and hydraulic pressure
- Integral oil reservoir

The above are standard features built into every WILLIAMS-WHITE Hydraulic Gap Frame Press. Regularly built in capacities from 15 tons, with cast or welded steel plate frames, their simple design, sturdy construction, accessible work area, low initial cost and long, trouble-free life are factors to be considered when purchasing a hydraulic press for bending and straightening operations. Why not discuss your requirements with us before you buy?

The press illustrated has 100 tons capacity, 120" x20" removable table, 20" daylight and 16" stroke. It is located in a plant of North American Aviation, Inc.

BUILDERS OF MACHINERY SINCE 1854

WILLIAMS-WHITE & Co.
304 EIGHTH ST. • MOLINE, ILLINOIS
PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS

REPRESENTATIVES
CALIFORNIA, Los Angeles: George A. Davies Machinery Co.
MISSOURI, St. Louis or Kansas City: Robt. R. Stephens Machinery Co.
NEW YORK, Buffalo: H. D. Thwaett Co.
OHIO, Cincinnati: Columbus or Dayton: Seifreat-Elsted Machinery Co.
OREGON, Portland: Allied Northwest Machine Tool Corp.
PENNSYLVANIA, Pittsburgh: Frank Ryman's Sons
Wynnewood (Phila.): Edw. A. Lynch Machinery Co.
WASHINGTON, Seattle: Perine Machinery and Supply Co.
WISCONSIN, Milwaukee: Pagel Machinery Co.

SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard
SINCE 1907

MODEL D

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

TANNEWITZ

VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.

The TANNEWITZ WORKS Grand Rapids, Michigan

A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES

CAMS OF ALL TYPES

Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering

Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

Ask for Catalog 55C

Contract production; Special automatic machines

EISLER ENGINEERING CO., INC.

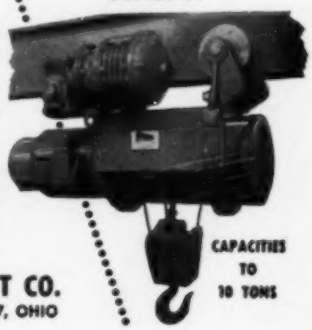
EUCLID CRANES

These two EUCLID machine tool assembly cranes share the work with the unit in the foreground handling sub-assemblies, and the higher capacity, 2-hoist crane in the rear lifting small assemblies as well as heavy completed machines.

Manufacturers who handle machines or materials in their operations will want the EUCLID CRANE CATALOG and the SERIES H HOISTS circular. Write today.

THE EUCLID CRANE & HOIST CO.
1367 CHARDON ROAD • CLEVELAND 17, OHIO

EUCLID HOISTS
Series H



CAPACITIES TO 10 TONS

NEW

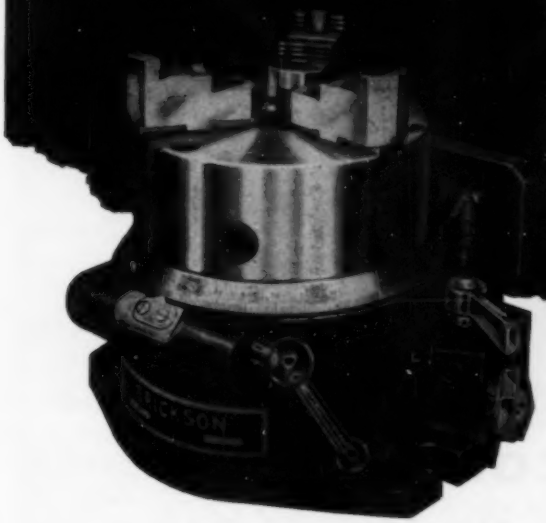
ERICKSON
MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

straddle milling

milling



inspection

jig drilling
with either micrometer or "Jo" block setting

Write for free catalog "Erickson Master Spacer" today. And at the same time request your copy of Catalog K you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer **quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.**

The new Erickson Master Spacer, **ideal for tool room and production machining, assures outstanding performance under heavy helical cuts and slow feeds. *Indexing accuracy guaranteed within .001-inch cumulative error on a 6-inch diameter circle.*** **Jig drilling is possible with either micrometer or "Jo" block setting. Timken bearing construction permits work to be trued in position with brake off because spindle alignment remains unchanged.**

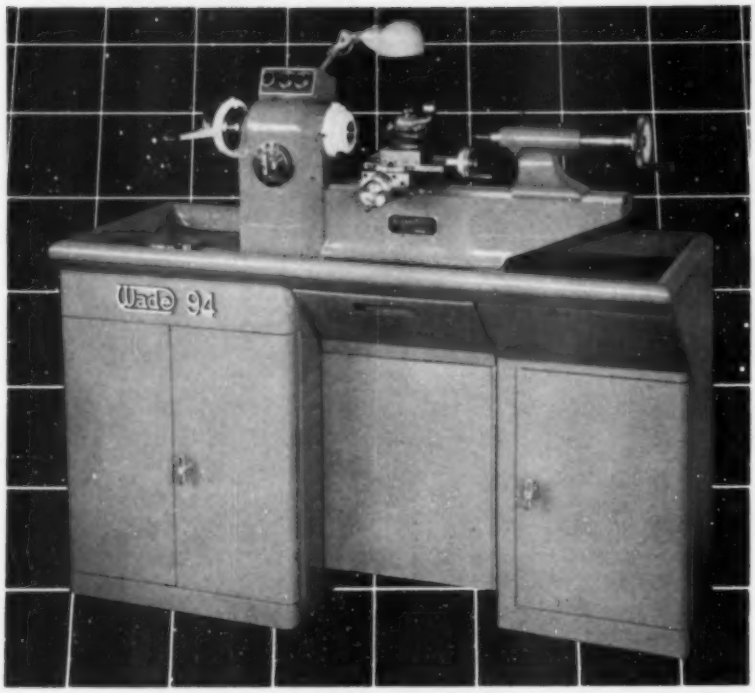
The new Erickson Master Spacer **can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.**

AA-3091

ERICKSON TOOL COMPANY

34359-6 Solon Road • Solon, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES



94 FINISHING LATHE

Center drive slide rest with large satin chrome resettable dials which read directly in thousandths . . . Open side tool post and rear tool station, standard equipment . . . Self centering 3 point suspension hardened and ground bed . . . Control center operation with push button speed changing.

Ask for literature that describes the many amazing new features.

THE WADE TOOL CO.
53 RIVER STREET, WALTHAM 54, MASS.

WHAT'S AHEAD?...see Page 2

Yes, American Machinist's "Chips" column on page 2 of each issue forecasts coming events in future issues, and also points up behind-the-scenes stories of how current articles are gathered and written. Form the "Chips" habit—read it every issue.

American Machinist
330 W. 42nd STREET
NEW YORK 36, NEW YORK

Same lathe, same operator — but production way up!

+GF+ Work Driver makes the difference!

For turning between centers, simply mount the **+GF+** Work Driver on your present lathes. You eliminate driving dogs, forget about hand wrenching. Drive rough or smooth blanks — even improperly centered forgings — with a steady, evenly distributed force.

Reliable grip — even with the heaviest roughing cuts.

An easy rotation of the hood grips or disengages the workpiece

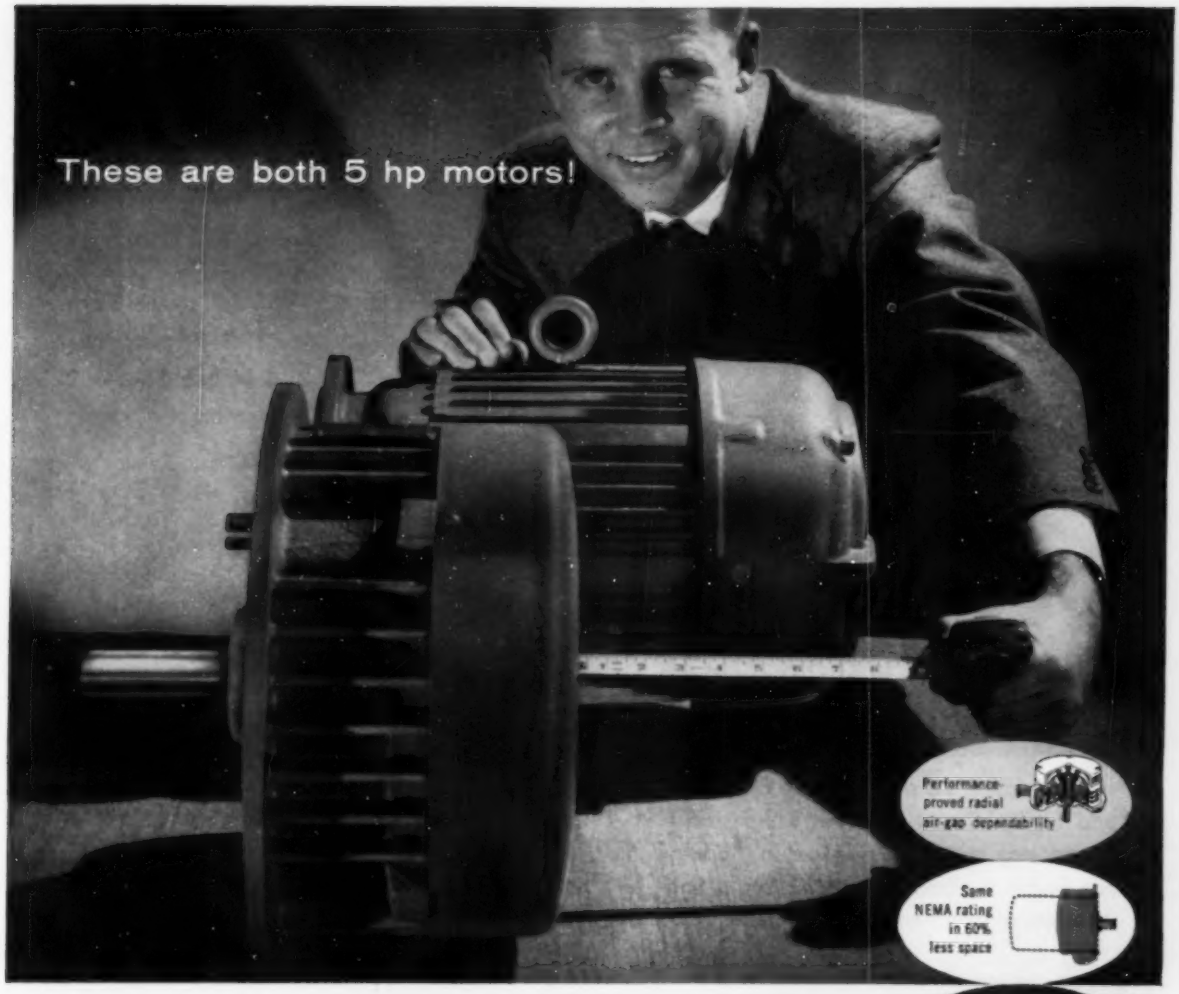
Five models give you diameter capacities of ¼" to 8-1/16".

Write for bulletin with full information and specifications. Dept. 106.

Skinner Chuck Company is national distributor for the **+GF+** Work Driver. Sales are handled through Industrial Distributors, Machinery Dealers, and Machine Tool Builders.

The Crest of Quality

THE SKINNER CHUCK CO.
ESTABLISHED 1887
NEW BRITAIN, CONNECTICUT



60% shorter– but with radial air-gap design!

New Louis Allis Pancake Motor preserves all the advantages of conventional motor construction

The new Louis Allis Pancake Motor is your solution to trouble-free power in any space-cramped motor application.

The Pancake is a remarkably short flange-mounted motor — up to 60% shorter and 33% lighter than standard motors of the same rating! And it is built in *conventional* radial air-gap design!

It's done by an ingenious forming process which literally compresses the end coils of a conventional radial air-gap motor into an exceptionally short length. The result is a compact, light motor ideally suited for horizontal or vertical mounting on machine tools, roof ventilating fans, or *any* close-quarter installation where space is a critical design factor.

What's more, this is achieved without sacrificing a single desirable characteristic: the stator still contains the same iron and copper as standard Louis Allis motors . . . standard NEMA service factor is maintained . . . high insulative values are retained by using proved Louis Allis varnishes and new insulating techniques . . . over-sized pre-lubricated bearings are used to guarantee long bearing life . . . and the entire motor is enclosed in an industrial-type cast-iron housing designed to shrug off abuse!

The housing and flange are cast in one piece: this permits extra-accurate internal machining which extends bearing life and reduces noise levels to a new low.

Investigate the Pancake Motor through your local Louis Allis District Office. Sized from 1 to 15 hp, at 1800, 1200, and 900 rpm, in open drip-proof and enclosed non-ventilated or fan-cooled enclosures. Write for Bulletins 2100 and 2150 to the Louis Allis Co., 452 E. Stewart St., Milwaukee 1, Wis.

SM-101

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

BAND SAWS CUT METAL

That's all. It's a pretty simple operation and no band saw—but no band saw—does it any better than a Famco. So why not find out about a Famco? You'll find it's a lot of band saw for the money.

Ask your dealer about Famco Band Saws or write for a catalog. We have lots of them hanging around and they're not doing us any good here.

famco machine company

3136 SHERIDAN ROAD • KENOSHA 6, WISCONSIN

AIR PRESSES • ARBOR PRESSES • BAND SAWS • DRILL PRESSES • FOOT PRESSES • POWER PRESSES • SQUARING SHEARS • MILLING MACHINES

From the *American Machinist* Library of *Tips for Top Shop Men*

DO you know just what you have in material and equipment inventories? If you don't, you'll drop more dollars than you think. It isn't necessary to know how many peanuts there are in the barrel (as one store clerk attempted to discover) but you must know how many barrels, and how rapidly one is used up.

Published only by American Machinist

How to Work STEEL

NOW—This 128-Page Special Report Is Available In Reprint Form

The supply is limited, but there is still time for you to order complete copies of this remarkable report. If you saw the *How to Work Steel* section in your 1955 Production PLANBOOK issue of *American Machinist* . . . you know every production executive and engineer in your shop can make profitable use of the information it covers.

Nowhere else can you find so much up-to-date and concise data on each type of steel, its properties, and the best techniques for all working methods. Most of this information, you may recall, is what often is called "handbook" data—standard and accepted procedures. But *How to Work Steel* is more current than any handbook. And this report gives you the facts you want fast. An easy-to-follow index classifies the heat-treating, machining, forming, and forging, as well as finishing methods, for each important type of Metalworking's basic material: cast iron, cast, wrought, stainless, and tool steel. In addition, these operations are illustrated profusely with invaluable graphs, diagrams, and tables.

For prompt, personal service, place your order today for one or more copies. $.50 each.

READER SERVICE DEPT.

American Machinist

McGRAW-HILL BUILDING

NEW YORK 36, N. Y.

MAGNA-LOCK MAGNETIC CHUCKS
give machine productivity a lift

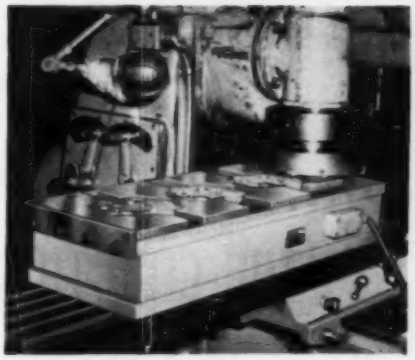
"ROUGH CASTINGS MACHINED 75% FASTER" states Stuart E. Zillman, Machine Shop Supervisor at Graham Manufacturing Company, Inc., Batavia, N.Y.

"In these days of tough competition all production corners must be cut. Our Magna-Lock setup enables us to do just that. There are no bolts, no levers. Merely switch off the chuck, remove the work-pieces, blow off the chips, insert new pieces, switch on and go!

"The tremendous holding power of Magna-Lock chucks is clearly demonstrated by the fact that we can machine three of these rough castings at a time."

You, too, can step up the productive efficiency of your machines, old or new. A comparatively small investment in Magna-Lock magnetic chucks soon pays off in improved machine and operator productivity and in better work quality.

You'll want full details about the many sizes and types of Magna-Lock chucks so just write or phone today, Dept. A-68.

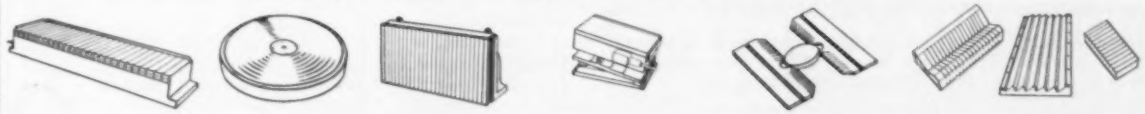


Magna-Lock chuck holds three rough castings while they are machined in a single setup with a 12" face mill.

Hanchett MAGNA-LOCK CORPORATION

BIG RAPIDS, MICHIGAN, U.S.A. P. O. Box 816 Telephone 815

Designers and makers of a complete line of magnetic chucks and devices.



Rectangular, rotary, vertical face, swiveling and angular elevation electrical chucks and permanent magnet chucks

Electrical and permanent magnet sine chucks

Magna-Vise permits magnetic chucks to hold non-magnetic materials

Parallels, V-blocks and top plates

48-hour repair service—electrical and permanent magnet chucks—any make.

THE CITY THAT DIDN'T EXIST A MONTH AGO

Every 30 days the U. S. adds as many new Americans as live in Norfolk, Va.—creating brand-new wants and needs which must be satisfied.

What does this mean to you? It means greater opportunities than ever before—in all fields. Home construction is expected to double by 1975. Power companies plan to increase output 250% in the next 20 years to provide the power for scores of new labor-saving devices. Clothing suppliers predict a one-third increase in 7 years.

With 11,000 new citizen-consumers born every day, there's a new wave of opportunity coming.

7 BIG REASONS FOR CONFIDENCE IN AMERICA'S FUTURE

1. **More people** . . . Four million babies yearly. U. S. population has *doubled* in last 50 years! And our prosperity curve has always followed our population curve.
2. **More jobs** . . . Though employment in some areas has fallen off, there are *15 million* more jobs than in 1939—and there will be *22 million more* in 1975 than today.
3. **More income** . . . Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.
4. **More production** . . . U. S. production *doubles* every 20 years. We will require millions more people to make, sell and distribute our products.
5. **More savings** . . . Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.
6. **More research** . . . *$10 billion* spent each year will pay off in more jobs, better living, whole new industries.
7. **More needs** . . . In the next few years we will need *$500 billion* worth of schools, highways, homes, durable equipment. Meeting these needs will create new opportunities for everyone.

Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act *now* to get ready for it.

FREE! Send for this new 24-page illustrated booklet, "Your Great Future in a Growing America." Every American should know these facts. Drop a card today to: ADVERTISING COUNCIL, Box 10, Midtown Station, New York 18, N. Y.

(This space contributed as a public service by this magazine.)

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: "OPPORTUNITIES" :EQUIPMENT :USED OR RESALE

DISPLAYED RATE: ——RATES—— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $21.80 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $17.00 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.
AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

$4.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of American Machinist, P.O. Box 12, N.Y. 36, N.Y.

BRAKE—8' x 3/16" All-Steel Power Press
BRAKE—4' 10 ga. D&K Power Bending
BORING MILL—3" bar Horizontal G&L #0, MD
GRINDER—Cincinnati Centerless Nos. 2, 3, & 4
GRINDER—Cincinnati Tool & Cutter "Monoset", late
GRINDER—Hanchett Hydraulic Vert Spl 12x48"
GRINDER—Cincinnati Cylindrical 6x18", Hydr.
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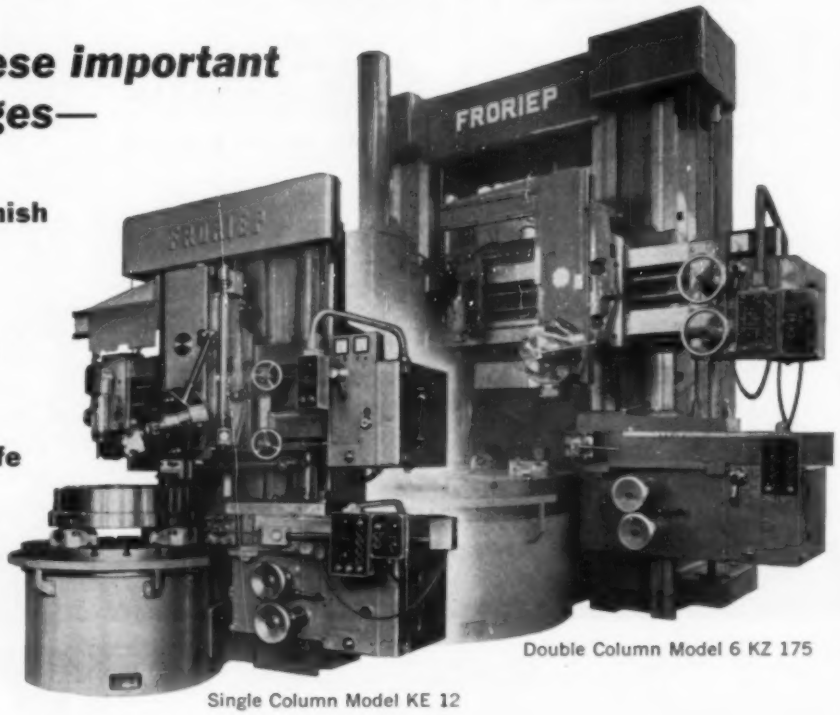

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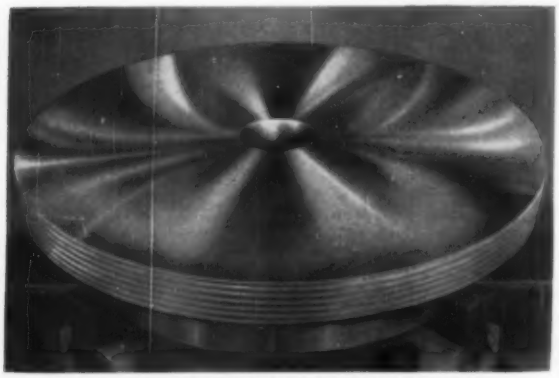

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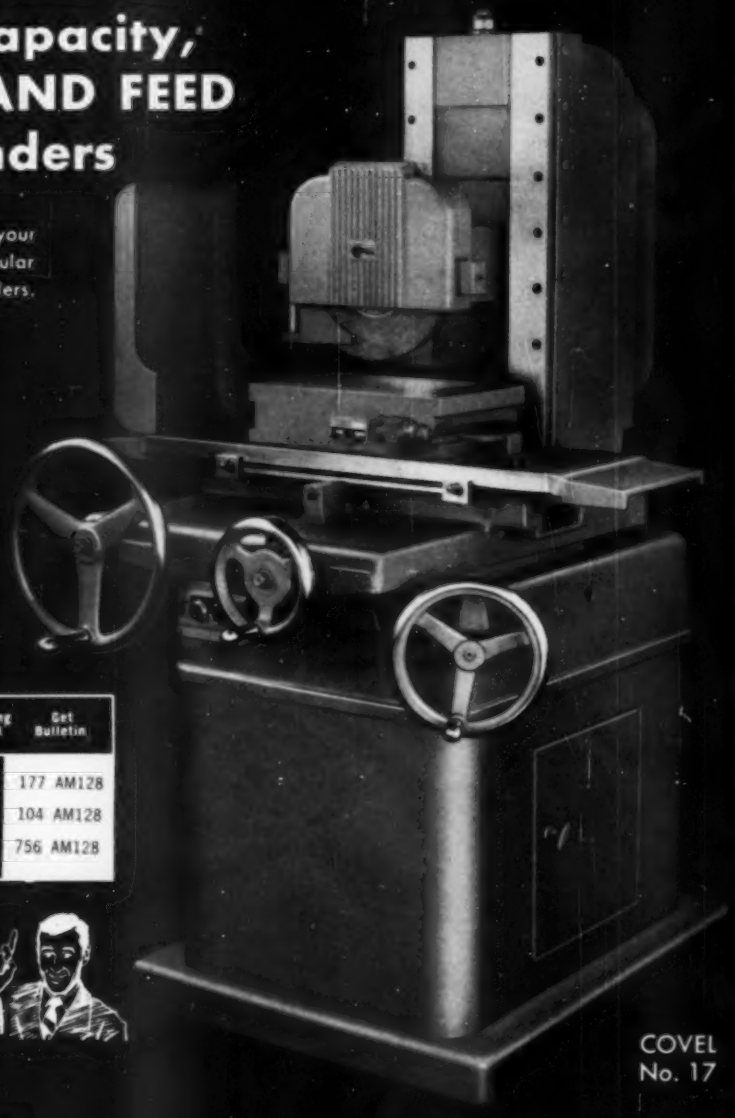

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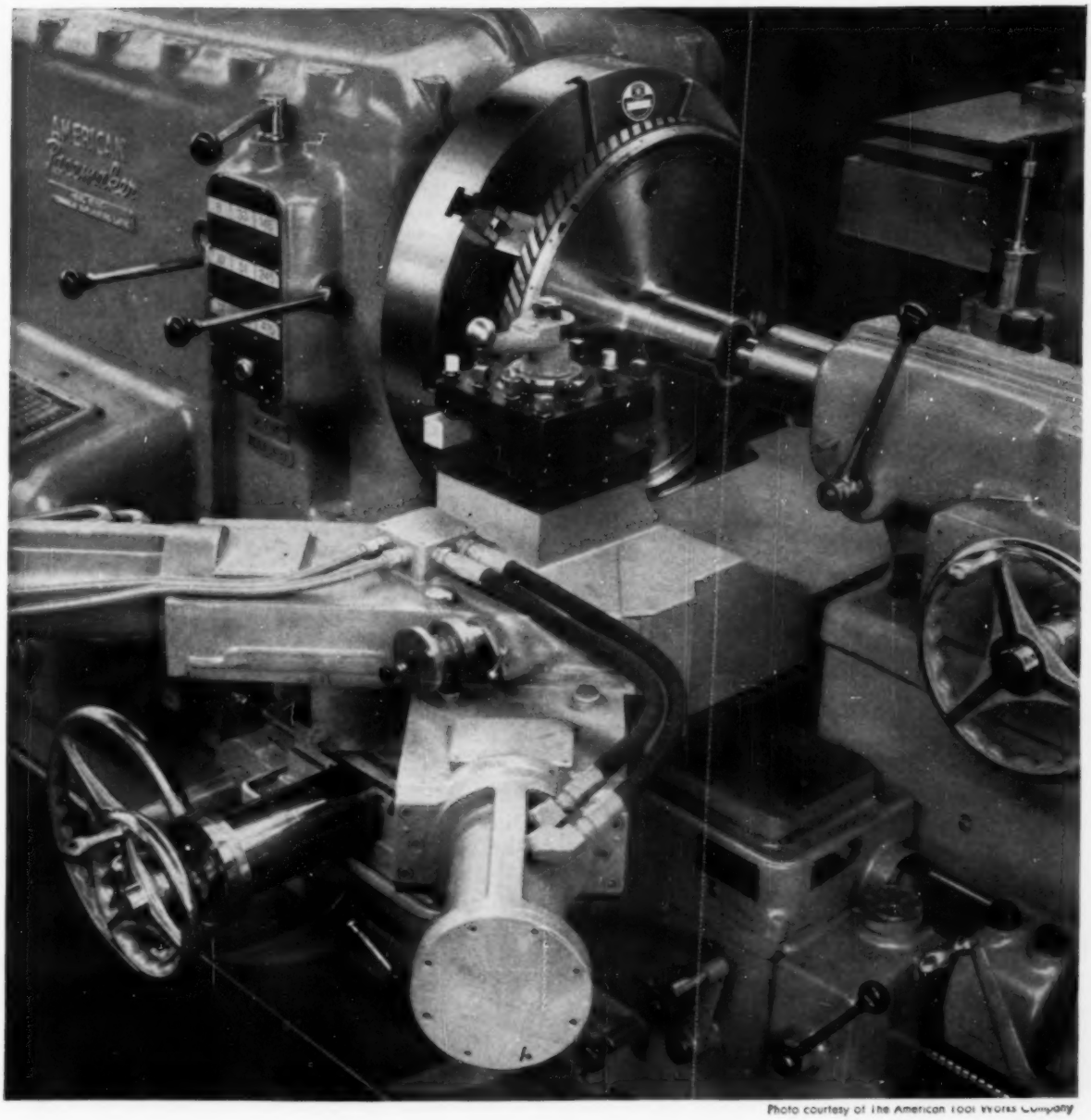

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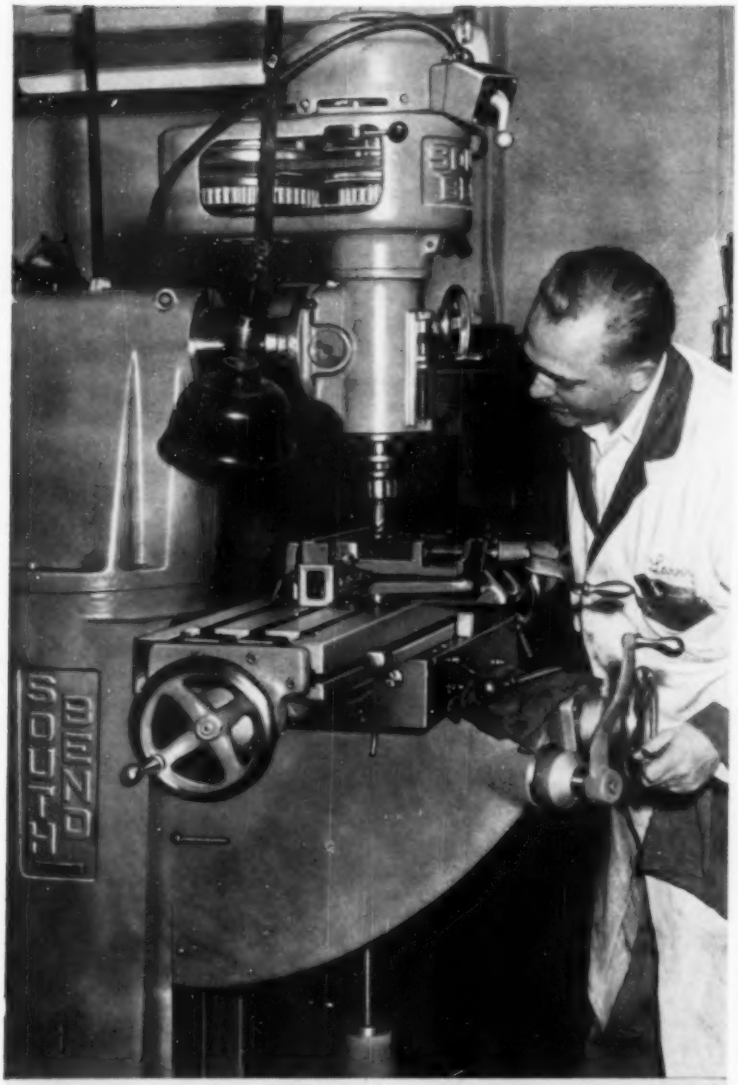

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